ELECTRICAL REVIEW

Osram

THE WONDERFUL LAMP

A G.E.C. PRODUCT

... and the jobs BICC get down to!

Making and laying underwater cables is just one of them. At present BICC are undertaking the supply and installation of four underwater cables, each cable being manufactured in one length of 17 miles without joints. They will cross the Georgia Strait between Vancouver Island and the mainland, forming part of an order for seventy-seven miles of 138,000-volt gas-pressure type cable for the British Columbia Electric Company.

BICC also make the thousand-and-one other types of electric cable used for transmission, distribution and telecommunications — and much of their associated equipment.

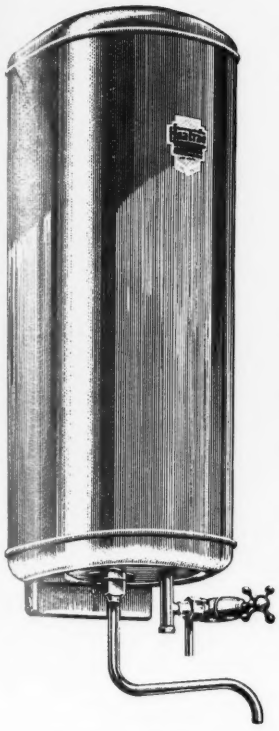
If you would like to know more about our vast range of products ask for Publication No. 215; if you would learn more of our activities as an organization, you will want No. 270 — "A Few Words About BICC". They are both available on request.

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET LONDON WC1 MUSEUM 44

BI Callender's

Simplicity—The Hallmark of Genius....

Heatrae *electric water heaters are so simple....*

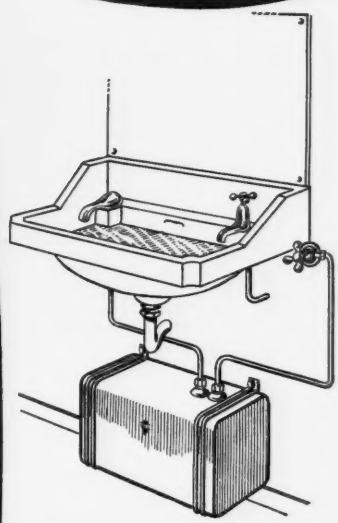


- Top and bottom fixing provides greater ease in fixing and a neater assembly.
- External Terminal Box for easy wiring. The ordinary V.I.R. cables terminate in a cool position.
- Instantly removable core-heating element.
- High-precision thermostat.
- Specially suitable for "Hard Water" districts.
- Easily adapted for overhead or underneath service — as shown.

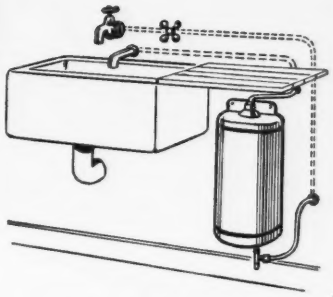
so simple to install

so simple to maintain

Ask us for Leaflet DE D



Also meet the **U.B. Type Water Heater,** made in 2-gallon size; automatically controlled; specially designed for use where no space is available above the sink or basin. Special fittings provided for convenience in connecting up these heaters.

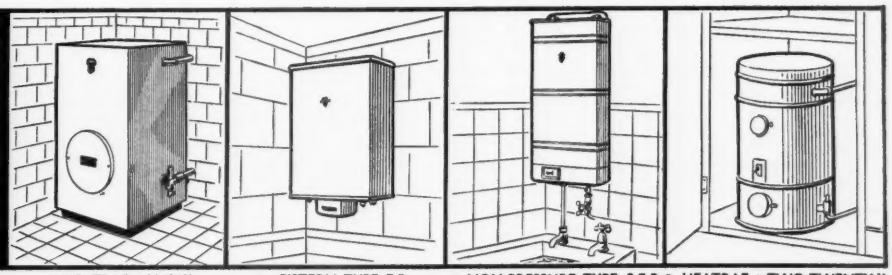


Here is shown how the Heatrae "DOT" can be fitted below the sink or wash basin. The "DOT" can be applied in several different ways to best suit local arrangements.

Meet the "DOT"!

... the dependable, economical and safe Electric Water Heater which, with its flat back and minimum projection, "fits in" any odd corner.

30 years specialised experience in designing and manufacturing of Electric Water Heaters



• HEATRAE "MAX" • CISTERN TYPE F.B. • NON-PRESSURE TYPE S.E.B. • HEATRAE "TWO-TWENTY"

Advertisement issued by HEATRAE LTD · NORWICH · ENGLAND

Manufacturers of: Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flameproof Heating Apparatus, Breakfast Cookers, Electric Fires, Food Trolleys, Warming Plates, Air Heaters

A

immediate comfort

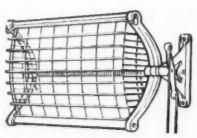
JUST WHAT THE PUBLIC WANTS

Once again the public is looking to electricity for clean, easy and reliable heating. And that is exactly what Ferranti is offering – in striking advertisements which will appear all winter in National papers and magazines.

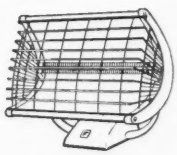
This year's range of Ferranti Radiant Electric Fires combines a new level of design with an efficient and economic performance. Be sure they will catch the public eye – in *your* showroom. We have ample stocks of all models to meet the coming demand.

Model F.3111
1250/2500 watts
£14.17.0 (Tax Paid)

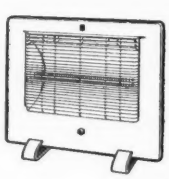
Model F.3117
1250/2500 watts
£16.14.7 (Tax Paid)



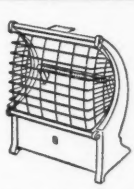
Model W.2781
1000 watts
£5.7.10 (Tax Paid)



Model F.3108
1000/2000 or
1250/2500 watts
£11.9.5 (Tax Paid)



Model F.3123
1000/2000 watts
£13.17.11 (Tax Paid)



Model F.3096
750/1500 or
1000/2000 watts
£6.16.7 (Tax Paid)

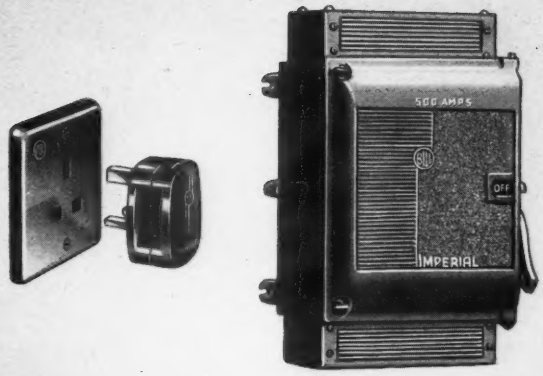
FERRANTI radiant electric fires

FIRST · FOREMOST · HOTTEST

FERRANTI LTD • MOSTON • MANCHESTER 10

BILL — YOU CANNOT BUY BETTER GEAR

You cannot buy better gear



BILL COMPLETE RANGE
13 AMP SOCKET OUTLET TO 500 AMP FUSE SWITCH

★ SOCKET OUTLETS
★ COOKER SWITCHES
★ DISTRIBUTION BOARDS
★ SWITCHES AND SWITCH FUSES
★ INDUSTRIAL PANELS

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
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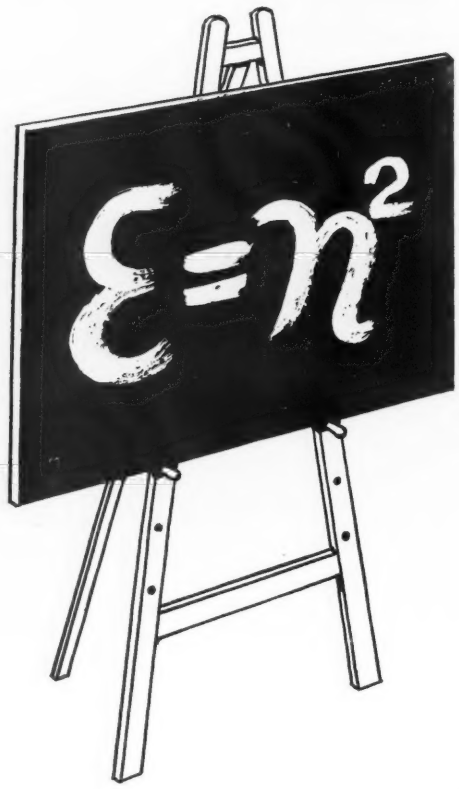
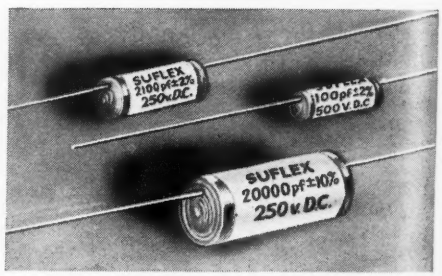


IN 1881 J. C. MAXWELL
derived this relationship
between dielectric constant
and refractive index.
That this holds true for
Polystyrene implies that
polarization is almost entirely
due to elastic displacement
of electrons only.
This means LOW DIELECTRIC
LOSS and dielectric constant
independent of temperature,
frequency and voltage.

SUFLEX POLYSTYRENE CAPACITORS, because of their LOW DIELECTRIC LOSS and SMALL SIZE are admirably suited for use in I.F. transformers and padded circuits. Their uniquely high insulation resistance and low dielectric absorption make them indispensable in computors, nucleonic and medical equipment.



* The capacitors shown here are actual size

CAPACITIES :	5 pf. to 0.5 mfd.
TOLERANCE :	20% to 1%
VOLTAGES :	250 V to 750 V D.C.
HS Type :	for general use
HSA Type :	with additional sealing for use in exceptional humidity conditions

SUFLEX *Limited*
LONDON

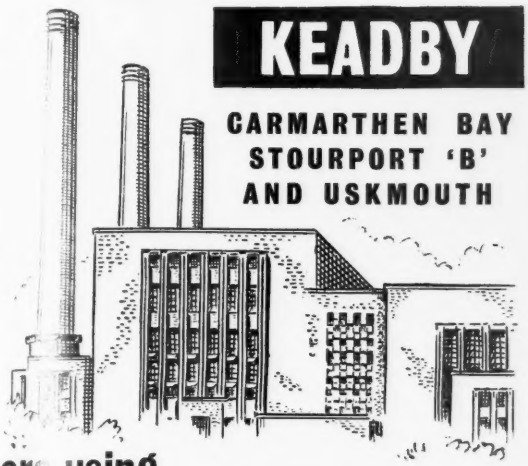
35 BAKER STREET, LONDON, W.1. *Telephone:* WELbeck 0791

POWER STATIONS

of the B.E.A including

KEADBY

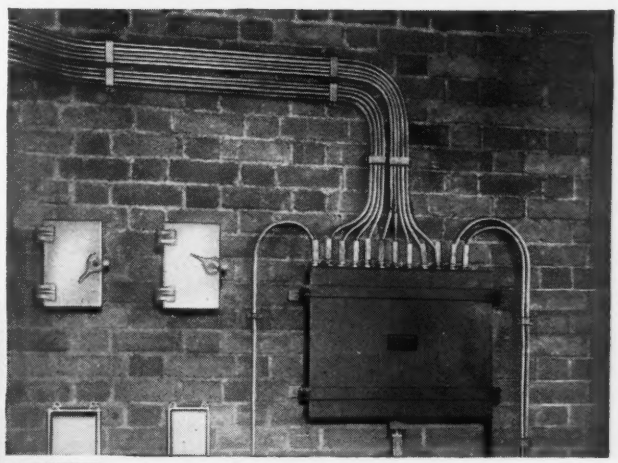
CARMARTHEN BAY
STOURPORT 'B'
AND USKMOUTH

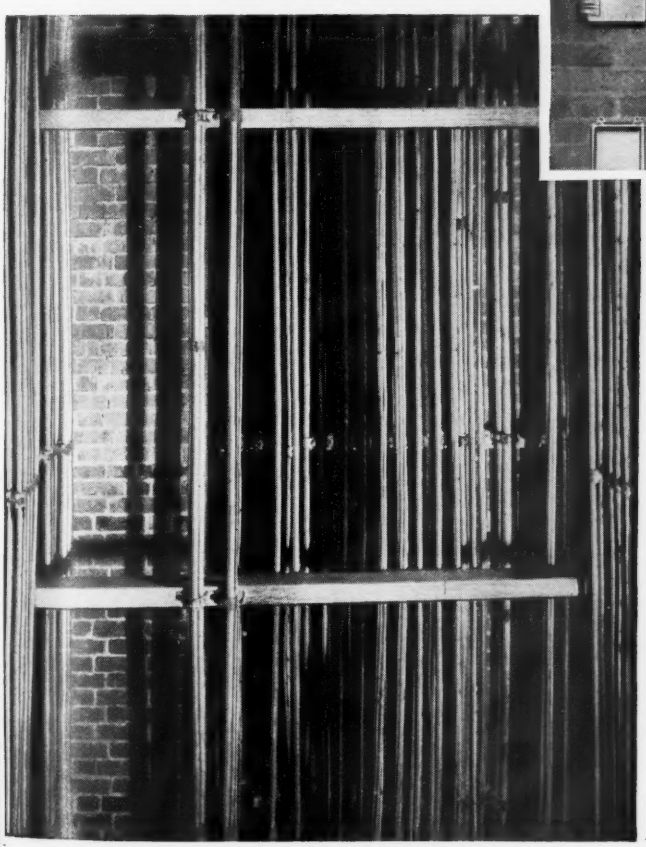


are using

J. & P.
ALUMINIUM SHEATHED
POWER & WIRING CABLES

BRITISH PATENT NUMBERS 627815 AND 627793





Above: Neatly installed formations of aluminium sheathed wiring cables terminating in a marshalling box.

Left: A main cable trunk at Keadby comprising 150 h.v. and l.v. cables, all but a few being aluminium sheathed.

Keadby is the first of several new power stations in which extensive use has been made of aluminium sheathed cables.

Three of the 60 MW sets are served by J. & P. Aluminium Sheathed Cables, a total of 73 miles of paper insulated and rubber insulated types being involved.

Photographs taken at Keadby Power Station.
Consultants: Messrs. Ewbank & Partners Ltd.
Cables installed by W. T. Henley's Telegraph Co. Ltd.,

JOHNSON & PHILLIPS LTD.

CHARLTON · LONDON · S.E.7

ELECTRICAL ENGINEERS & CABLE MAKERS

★ FIRST IN THE WORLD WITH ALUMINIUM SHEATHED CABLES

COUGHTRIE

FITTINGS

The Natural Selection

Always better than they have to be

CATALOGUE AVAILABLE ON REQUEST

MANUFACTURED AT **HILLINGTON, GLASGOW, S.W.2**

by **J. & G. COUGHTRIE Ltd.**

Sturtevant

PORTABLE

BOILER FLUE CLEANING MACHINES

Sturtevant equipment is of the most efficient kind for flue dust extraction. It permits extraction without dispersal of all dirt and dust from flues; provides the cleanest method of boiler flue cleaning; reduces labour involved; finds greater favour; considerably assists combustion efficiency. Details gladly sent on request. Please quote our reference U.101/26.

STURTEVANT ENGINEERING COMPANY LTD

Southern House, Cannon Street, London, E.C.4

MOTOR STARTERS

Type COBIF

D-O-L PUSH BUTTON OPERATED WITH BUILT-IN ISOLATOR AND FUSES

These air break or oil immersed starters are supplied for motors up to 7½ H.P.

Rewirable or H.R.C. cartridge pattern fuses.

For prices and details write for List 7-5

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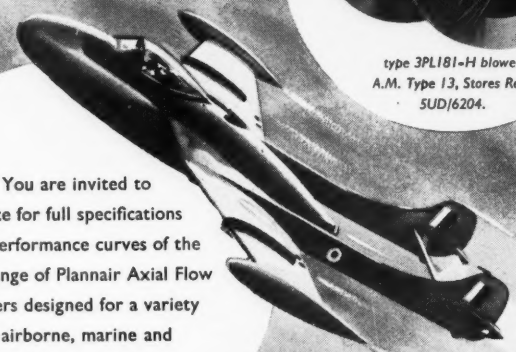
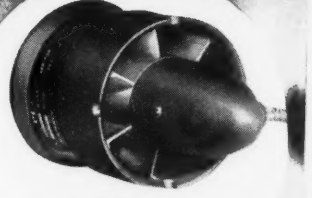
BELFAST: 11 COLLEGE SQUARE NORTH	BELFAST 24620

Plannair blowers chosen for the de Havilland Venom Mk.3

type 3PL181-H blower A.M. Type 13, Stores Ref: 5UD/6204.



You are invited to write for full specifications and performance curves of the wide range of Plannair Axial Flow Blowers designed for a variety of airborne, marine and ground applications.



type 2PL81-H blower A.M. Type 12A, Stores Ref: 5UD/6205.

PLANNAIR
REGISTERED TRADE MARK

FOR THE WORLD'S FINEST AIRCRAFT

PLANNAIR LIMITED WINDFIELD HOUSE LEATHERHEAD SURREY TEL LEATHERHEAD 4091/2231

TELEGRAMS & CABLES: PLANNAIR LEATHERHEAD FACTORY: GOBLIN WORKS LEATHERHEAD

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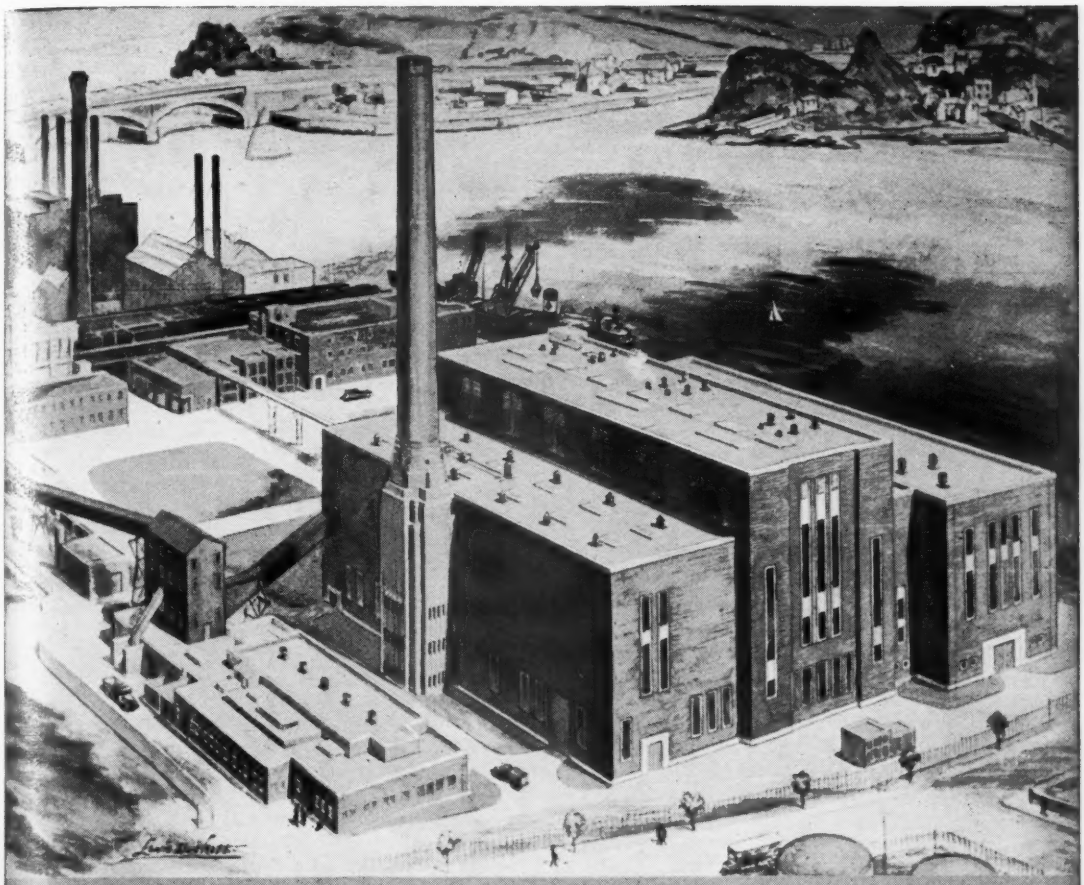


Plymouth 'B' Power Station

YARROW BOILERS

YARROW

and Company Limited

SCOTSTOUN · GLASGOW · W.4

Getting Coal with Night-lights!

WORK goes on throughout the night at the Open-Cast Coal Site, Ewart Hill, Bedlington, Northumberland. The operation is made speedy, easy and safe by the use of ten transportable lighting units, one of which is illustrated here. The cable used for this

exposed, all-weather duty

is 4-core pliable-armoured colliery-type trailing cable, supplied by:

ST. HELENS CABLE & RUBBER CO. LTD.
SLOUGH, BUCKS. Telephone: SLOUGH 20333

Branches at:—Bath, Belfast, Birmingham, Bradford, Cardiff, Glasgow, Lancaster, Liverpool, London, Manchester, Newcastle-on-Tyne, Portsmouth.

Photographs by courtesy of:
The National Coal Board
The Parkinson Strip Mining Co Ltd.
Messrs. F. H. Wheeler & Co. Ltd. Newcastle (Electrical Contractors

WINGS DAY SEPT 18th Give for those who Gave

ST. HELENS CABLES

FERRANTI High Voltage Testing Equipment

Norway

The 1,000,000 Volt D.C. Ferranti Testing Equipment can be seen in the foreground. All the Testing Equipment illustrated has been supplied by Ferranti Ltd. and is installed at the Research Laboratory of Standard Telefon og Kabelfabrik A/S, Oslo, Norway.

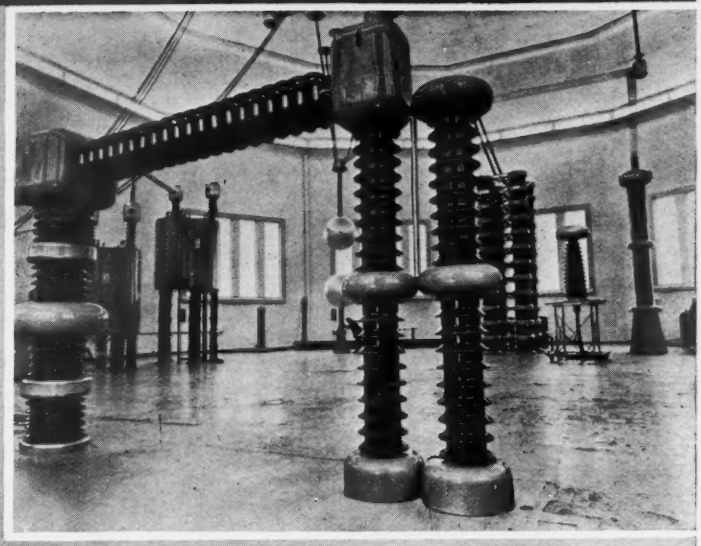
It consists of:—

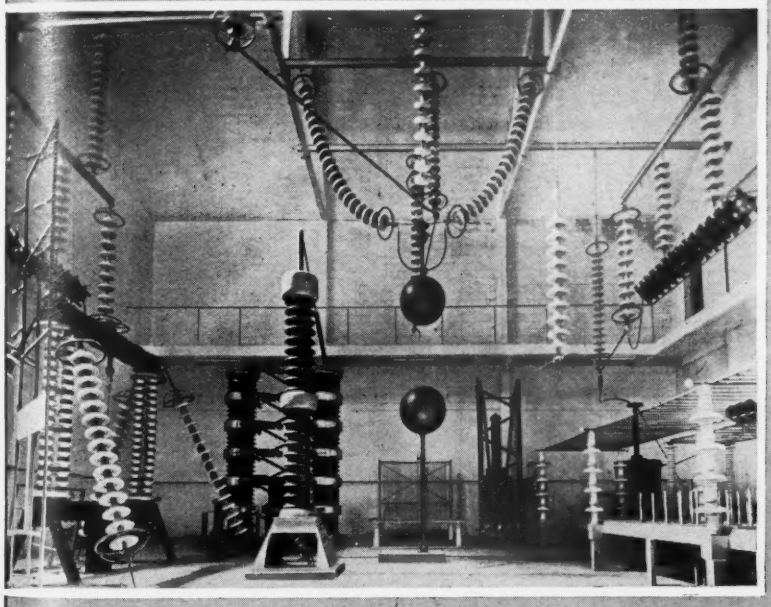
Foreground: 1,000,000 Volt D.C. Testing Equipment.

Right: 600 kV, 1200 kVA A.C. Testing Equipment.

Background: 12 Stage, 2,000,000 Volt Impulse Generator.

A 1500 mm sphere gap and surge potentiometer can also be seen in the background.





Argentina

A 1,000,000 Volt Ferranti Impulse Generator installed in the Laboratories of Fabrica de Porcelana Armanino, Buenos Aires, Argentina.

This equipment produced the first ever 1,000,000 Volt arc in Argentina. Ferranti are also supplying to the same customer a 500,000 Volt, 250 kVA A.C. Testing Equipment.

FERRANTI ARE SPECIALISTS in the manufacture of A.C. and D.C. equipment for all kinds of routine and research testing, and are backed by over 70 years' experience in the manufacture and development of electrical apparatus.

FERRANTI

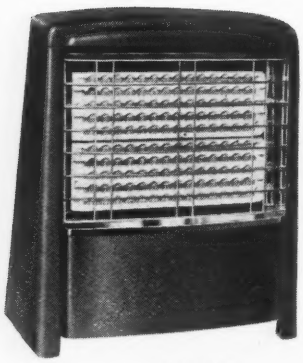
FERRANTI LTD · HOLLINWOOD · LANCS · ENGLAND

London Office: KERN HOUSE, 36, KINGSWAY, W.C.2

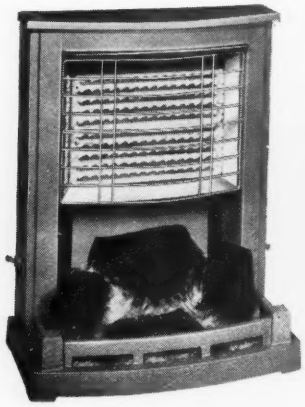
FT.147

It's time to stock up!

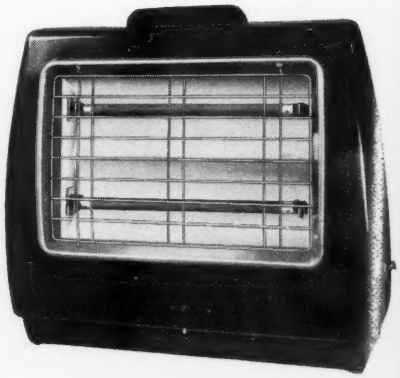
Here are some of our latest heating appliances:



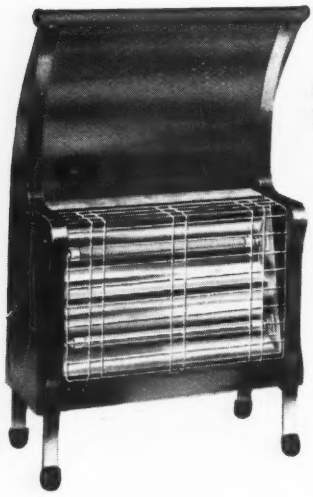
DAINTY
No. 226 2 kW size £6.3.0. inc. tax
Finish: Light Bronze.
No. 226P 2 kW size £7.10.4. inc. tax
Finish: Electro-Plated Bronze.



CHEERY
No. 360 2 kW size £9.11.4. inc. tax
Finish: Silver or Bronze.

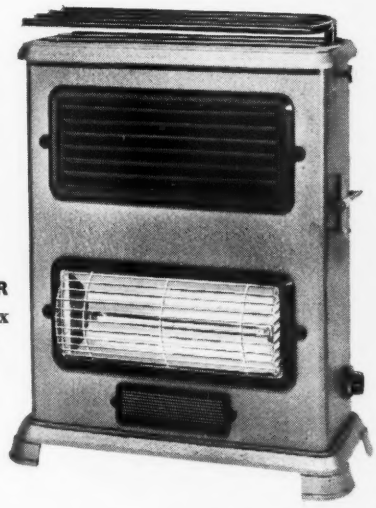


MODERN
No. 228 2 kW size £8.4.0. inc. tax
Finish: Light Bronze.
No. 228P 2 kW size £10.5.0. inc. tax
Finish: Electro-Plated & Light Bronze.



SUNSET
No. 323 2 kW size £13.6.6. inc. tax
Finish: Oxidized Copper.

RADIANT CONVECTOR
No. 750 2 kW size £17.8.6. inc. tax
Finish: Ripple Bronze or Cream.



Our fires are being extensively advertised in the National and Provincial Press. Make sure you are ready to meet the demand by sending us your orders right away.

Look out for our NEW 1954-55 Catalogue

You can't beat a "Belling"

BELLING & COMPANY LIMITED, BRIDGE WORKS, ENFIELD, MIDDX · HOWARD 1213
CRC 417

protect your power plant

with

LIGHTNING ARRESTERS

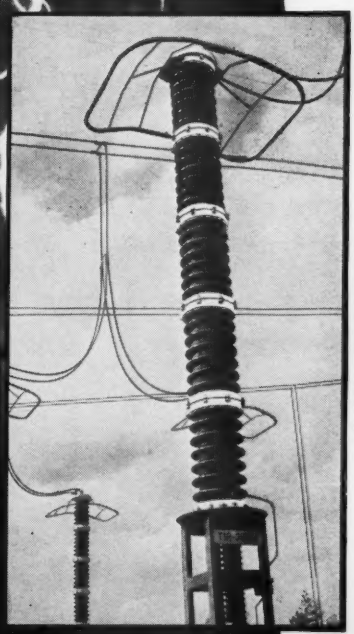
The ASEA Lightning Arrester is unrivalled for plant protection and service reliability. The Arrester comprises a number of spark gaps connected in series with a resistor of non-linear type.

Outstanding features of the ASEA Lightning Arrester are :

1. Low spark-over level at high impulse steepness.
2. Low discharge voltage.
3. Precision in manufacture ; discharge voltage guaranteed to 5% plus or minus.
4. Filled with pure dry nitrogen at atmospheric pressure and hermetically sealed.
5. Complies with American Standards A.I.E.E. 28 and 28a.

Standard Arresters for both D.C. and A.C. networks up to 160,000 volts are held in stock. Quick delivery can be offered for other Arresters.

Write for technical literature and for our Reference List of ASEA Arresters installed throughout the World.



380kV Lightning Arrester type XRSC.

ASEA

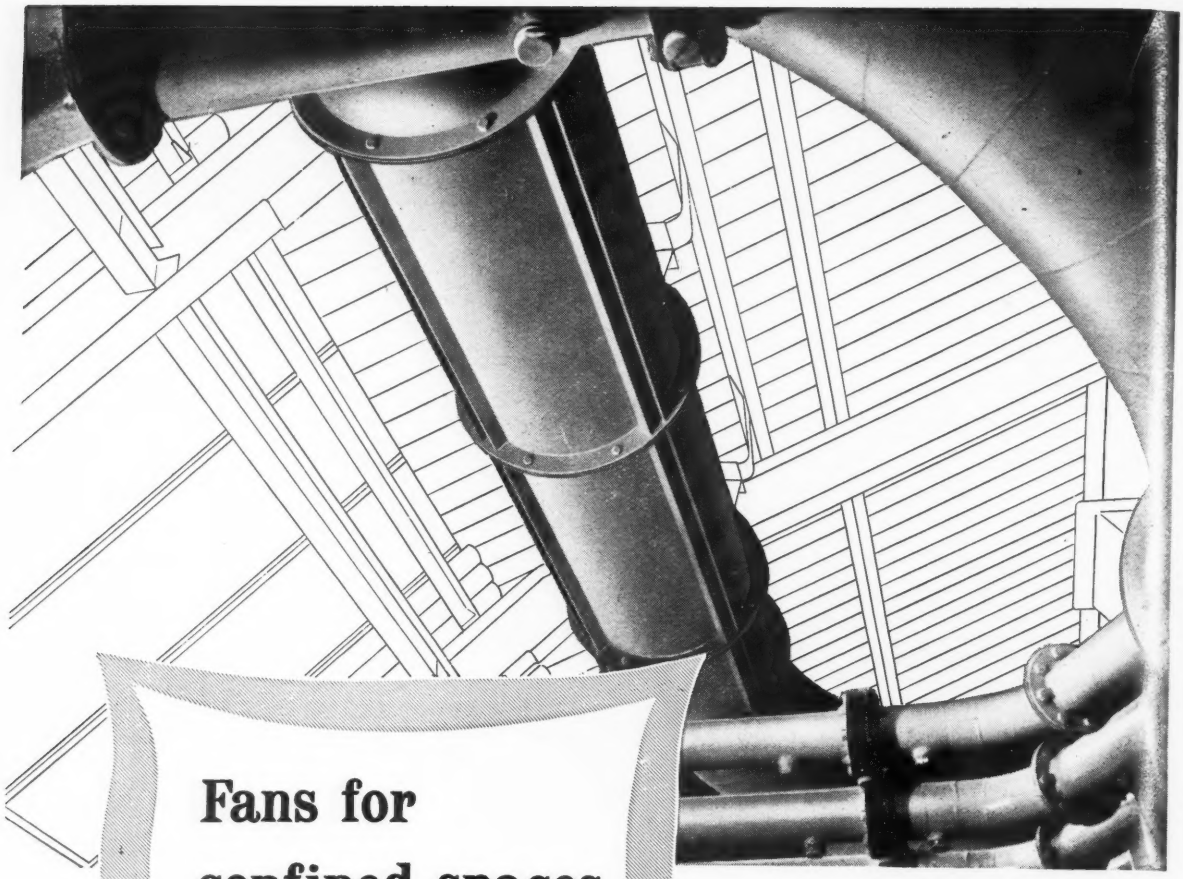
ASEA ELECTRIC LIMITED

Associated with Fuller Electrical & Manfg. Co. Ltd.

Fulbourne Road, Walthamstow, London, E.17

Phone : LARkswood 2350 (10 lines)

Also at: BIRMINGHAM : GLASGOW : MANCHESTER : DUBLIN



Fans for confined spaces

See how little space is occupied by this 5-stage Woods *Aerofoil* fan . . . how compactly it fits into the ducting. A two-stage contra-rotating fan can develop 7″ s.w.g. It is smaller than a comparable centrifugal, simpler to install, requires no bulky bends, no floor space, and consumes less current. High pressures are no longer the prerogative of the centrifugal fan; Woods multi-stage *Aerofoil* fans can develop 20″ s.w.g. or more. Woods fan engineer in your area will be happy to call. Write for publication V1089.

WOODS for Fans

WOODS OF COLCHESTER LIMITED, BRAISWICK WORKS, COLCHESTER.

An associate company of The General Electric Company Ltd.

It's best to wire with Crompton rubber cables

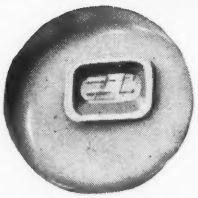
ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LIMITED

CROMPTON HOUSE · ALDWYCH · LONDON W.C.2

TELEPHONE: CHANCERY 3333

MAINS VOLTAGE *NEON* SIGNAL LAMP



Cat. No. S.L.860

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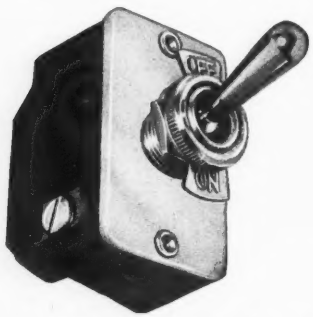

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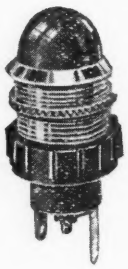

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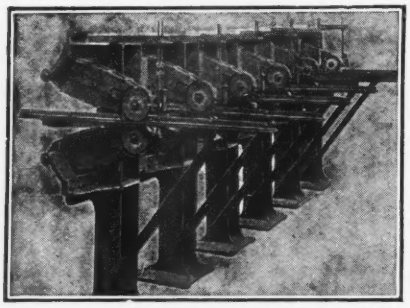

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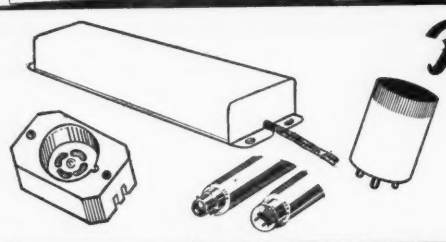

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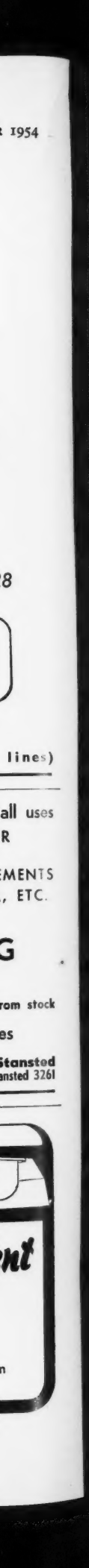

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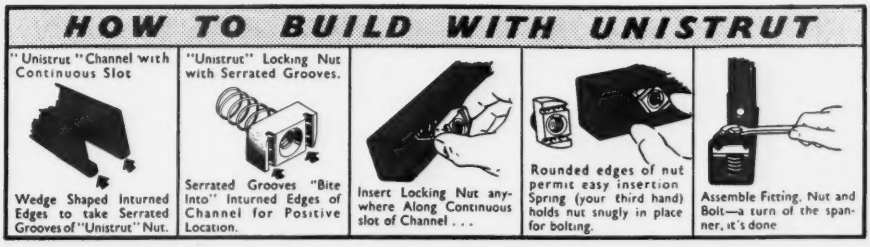
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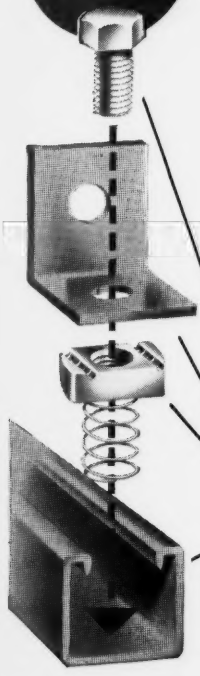

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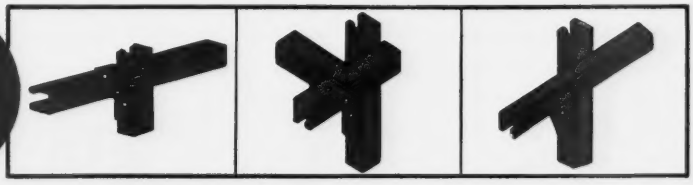

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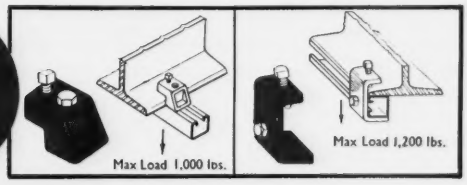

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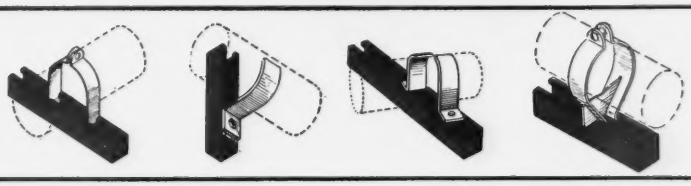

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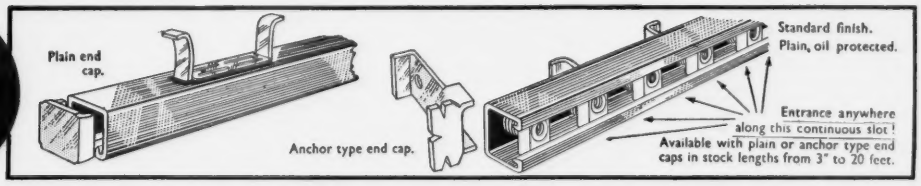
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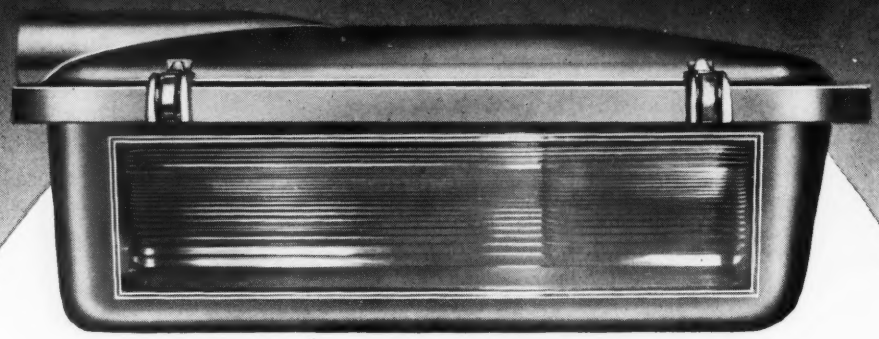

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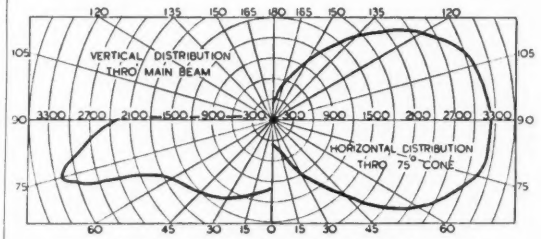

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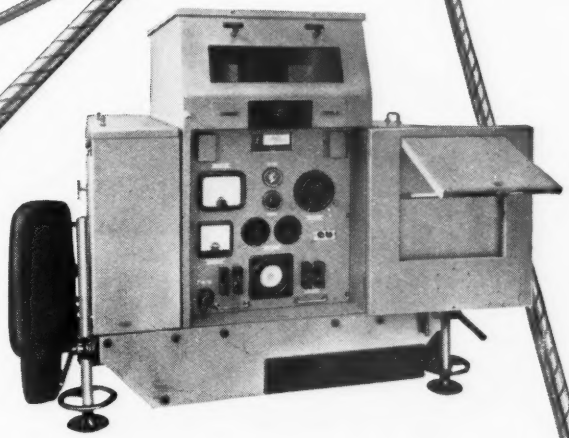

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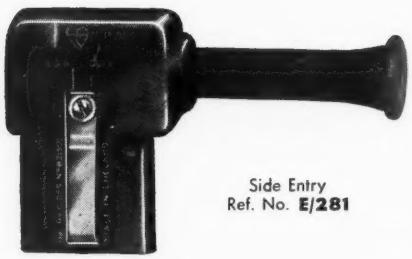

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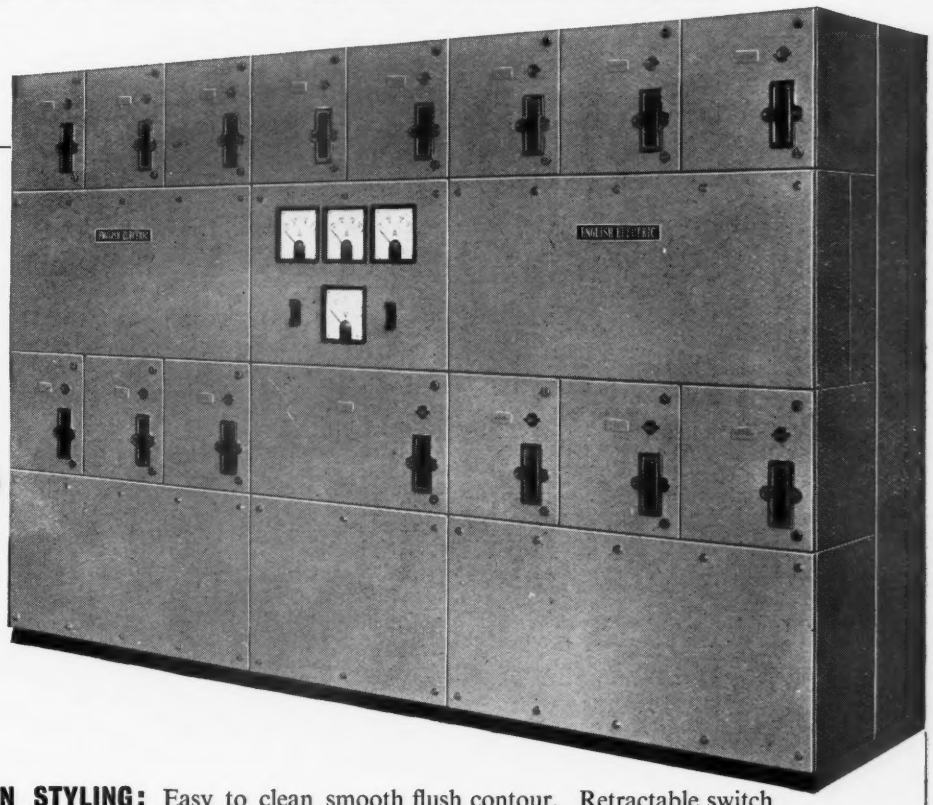

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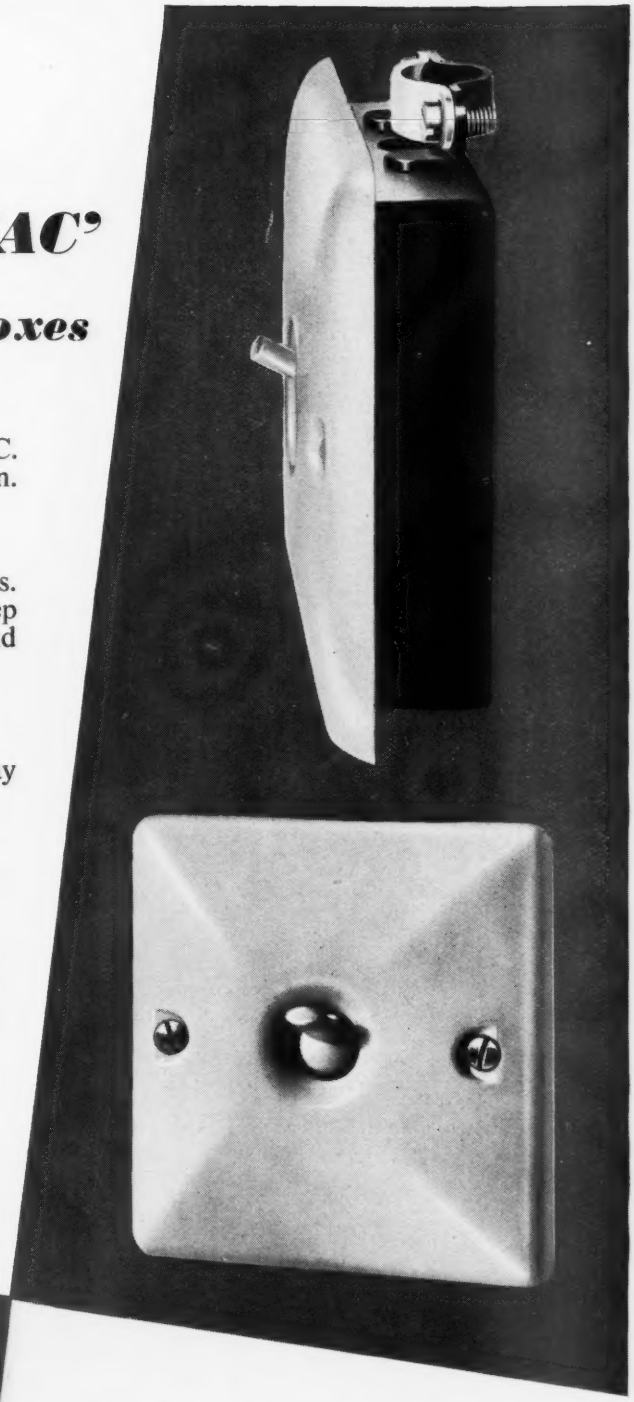

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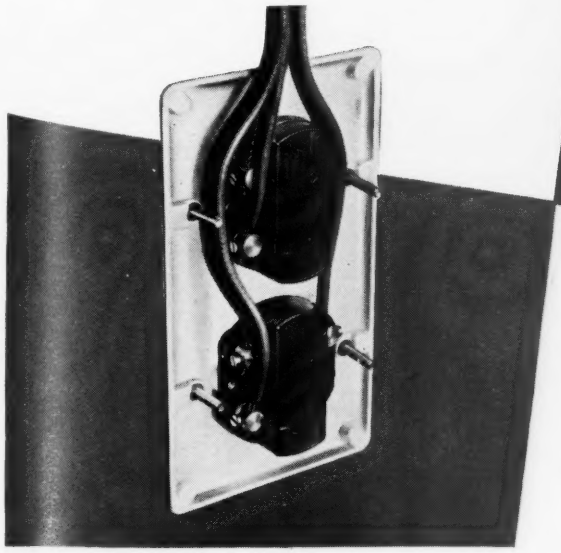

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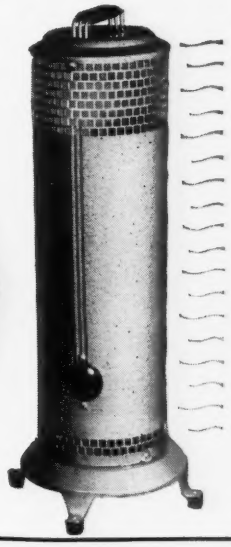

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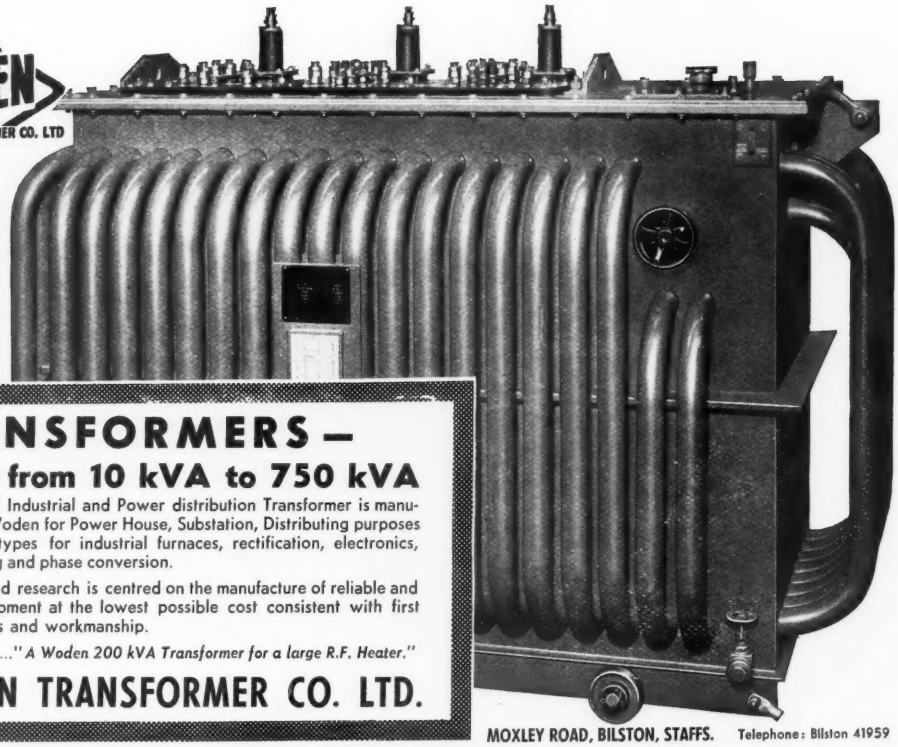

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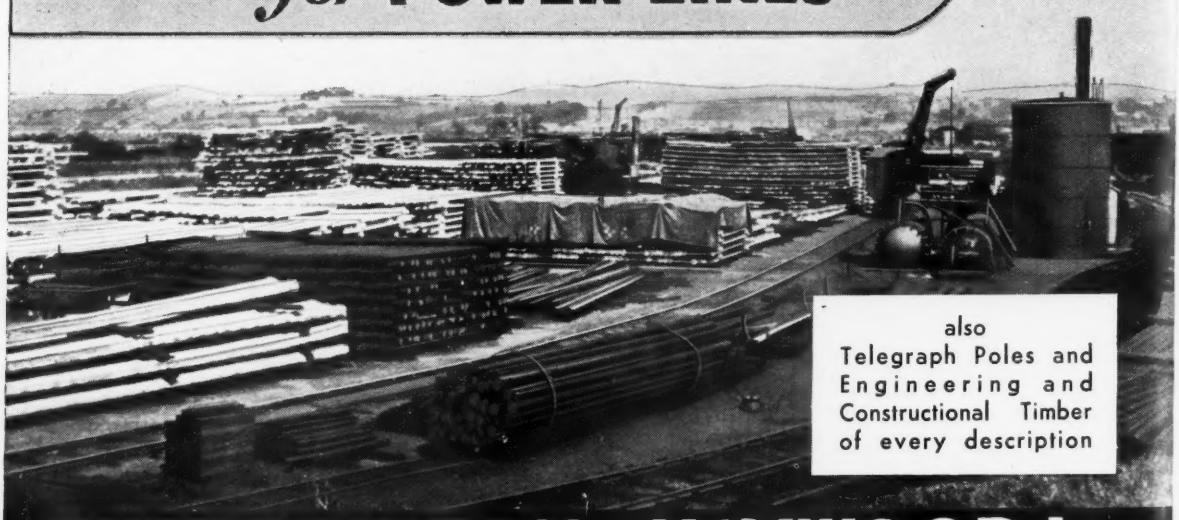

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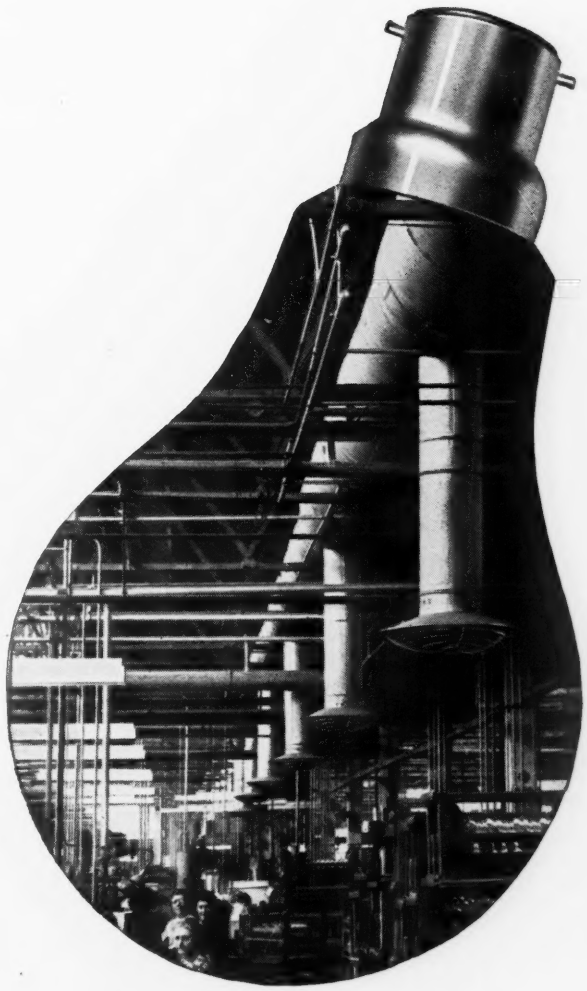

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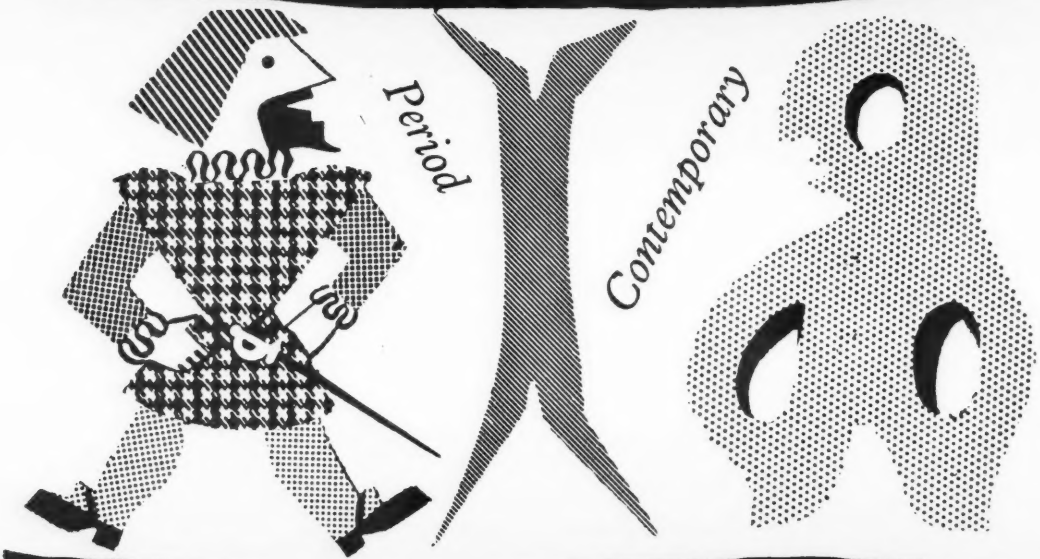

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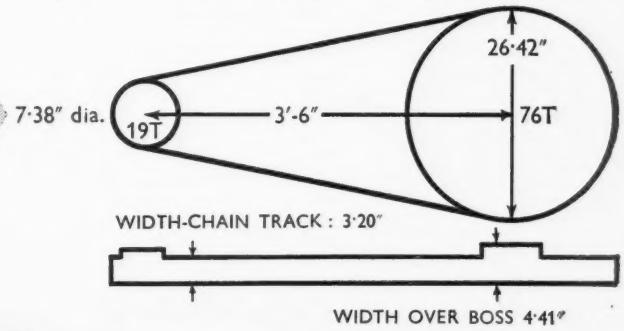
*SAVE SPACE WITH 1·0″ PITCH CHAIN DRIVES



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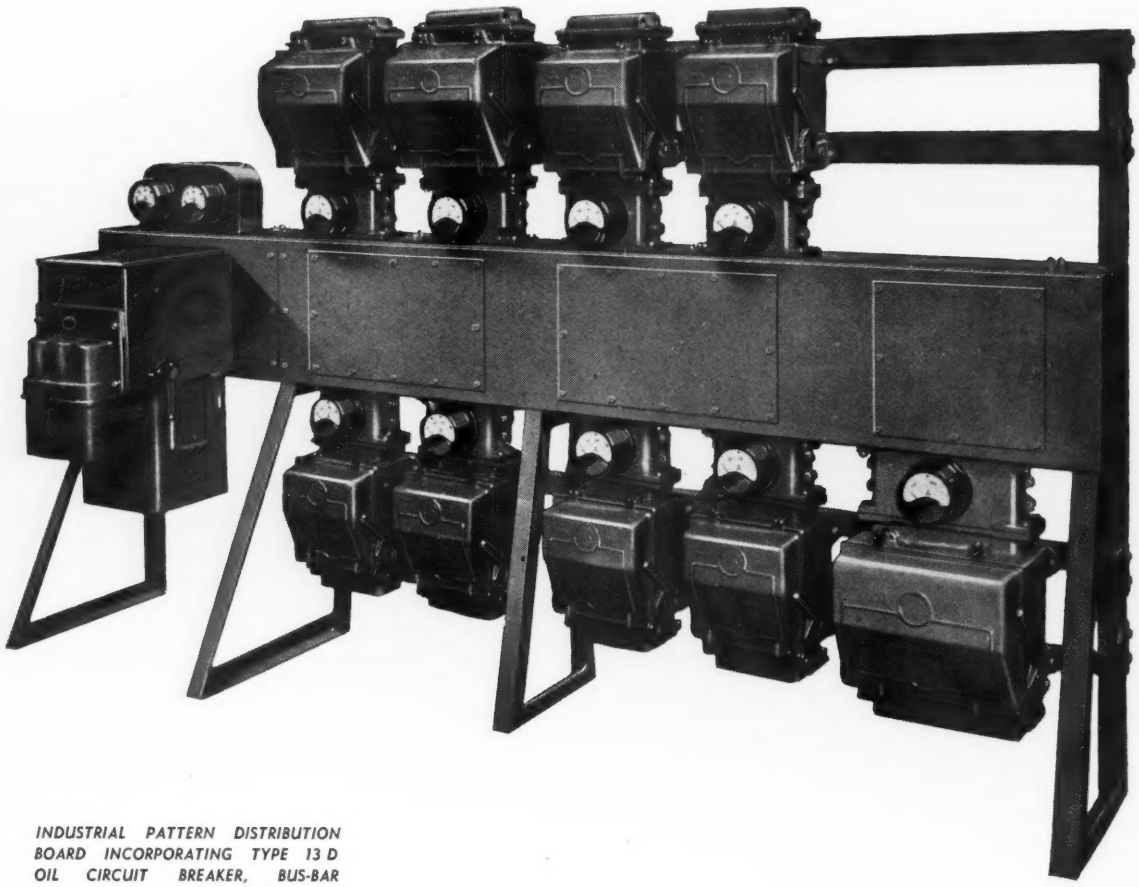

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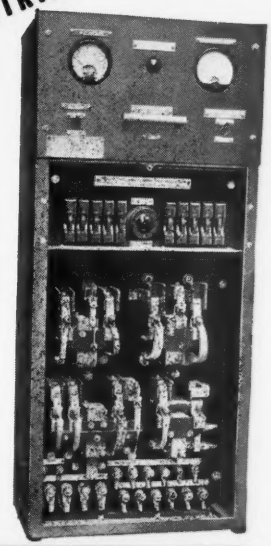

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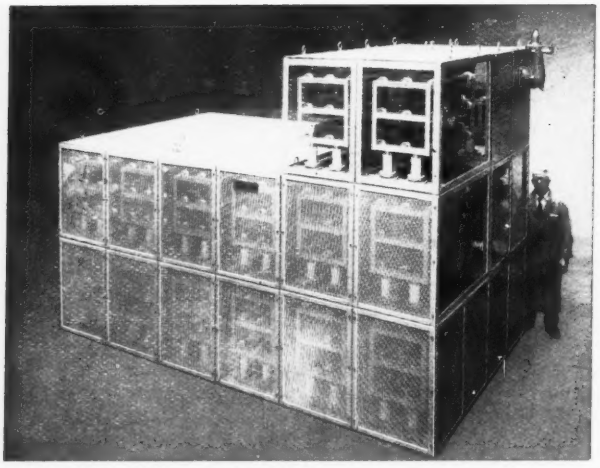

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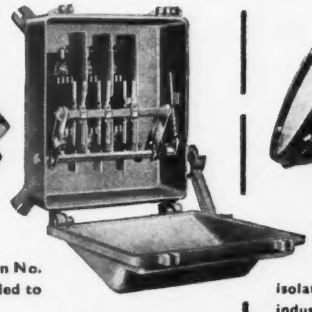
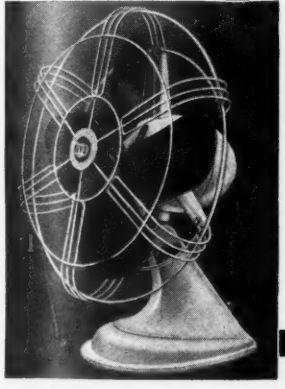
The unique Revo "Monarch" electric cooker—with eye-level switches extra large oven and hot-cupboard, non-tilt racks and maximum hob equipment.

The Revo electric iron No. F.14480 heat controlled to suit all fabrics.

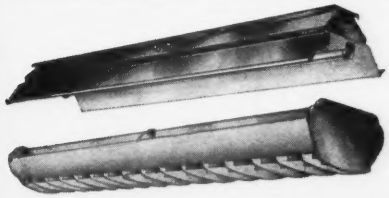


Typical of the range of Revo floodlights for tungsten, mercury or sodium lamps

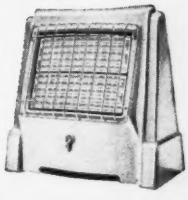
A heavy-duty isolating switch for industrial installations



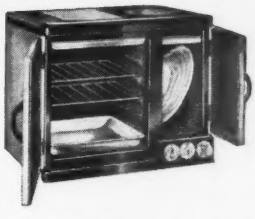
The range of Revo electric fans includes models for desk, wall and ceiling mounting.



An industrial trough type reflector fitting, together with a decorative model, both using 4 ft or 5 ft. tubular fluorescent lamps



The Revo "Dolphin" electric fire in vitreous enamel with B.S.S. guard



(left) The Revo "Peerless" cooker, designed for table use or with special stand, incorporates a roomy oven, plate warming compartment, grill-boiler and 8" boiling plate.

(right) This "Festival" fluorescent lantern and cast iron column is representative of the wide range of Revo street lighting equipment

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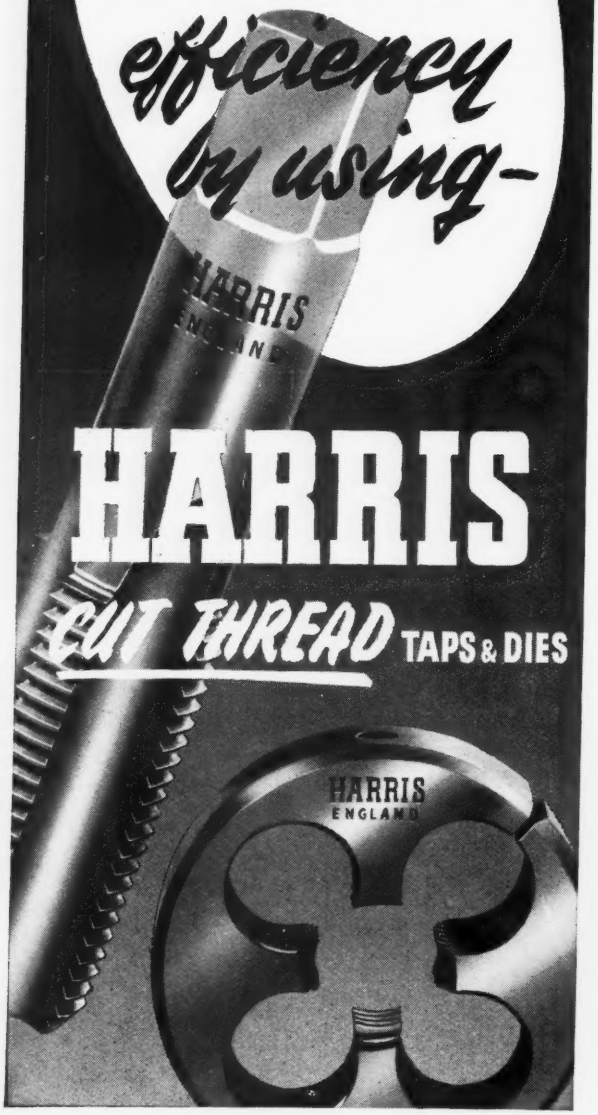

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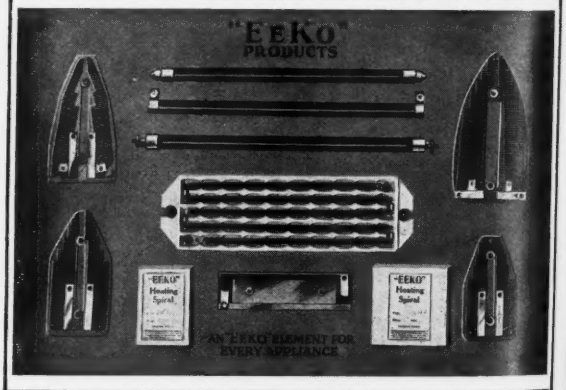

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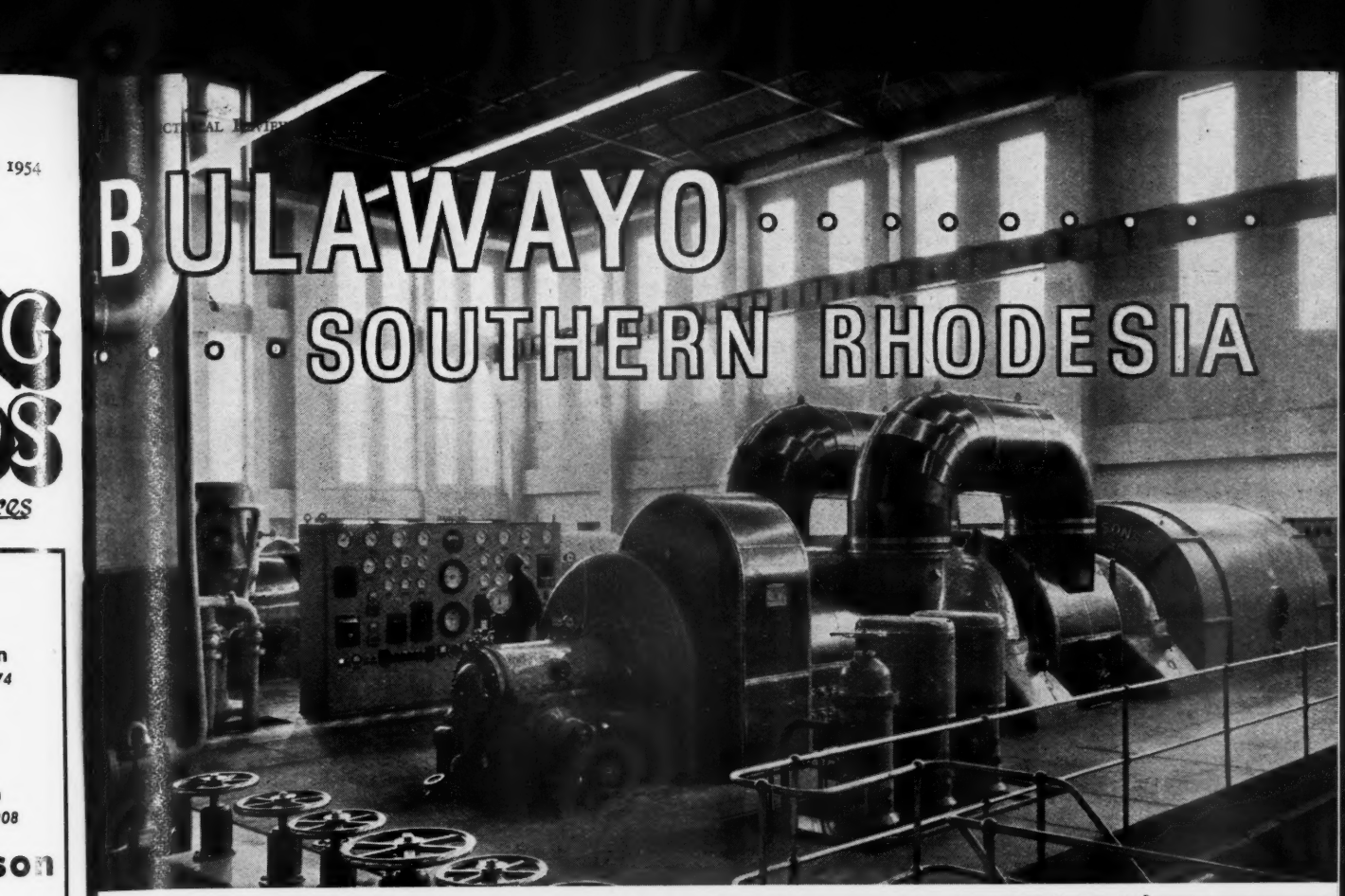

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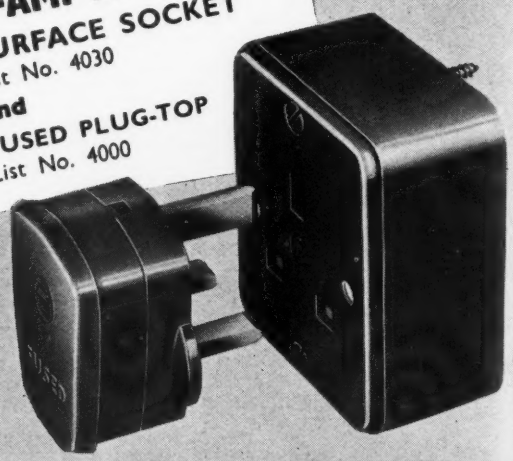

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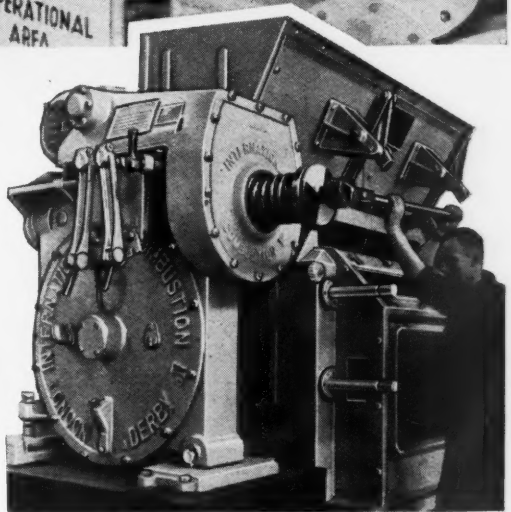
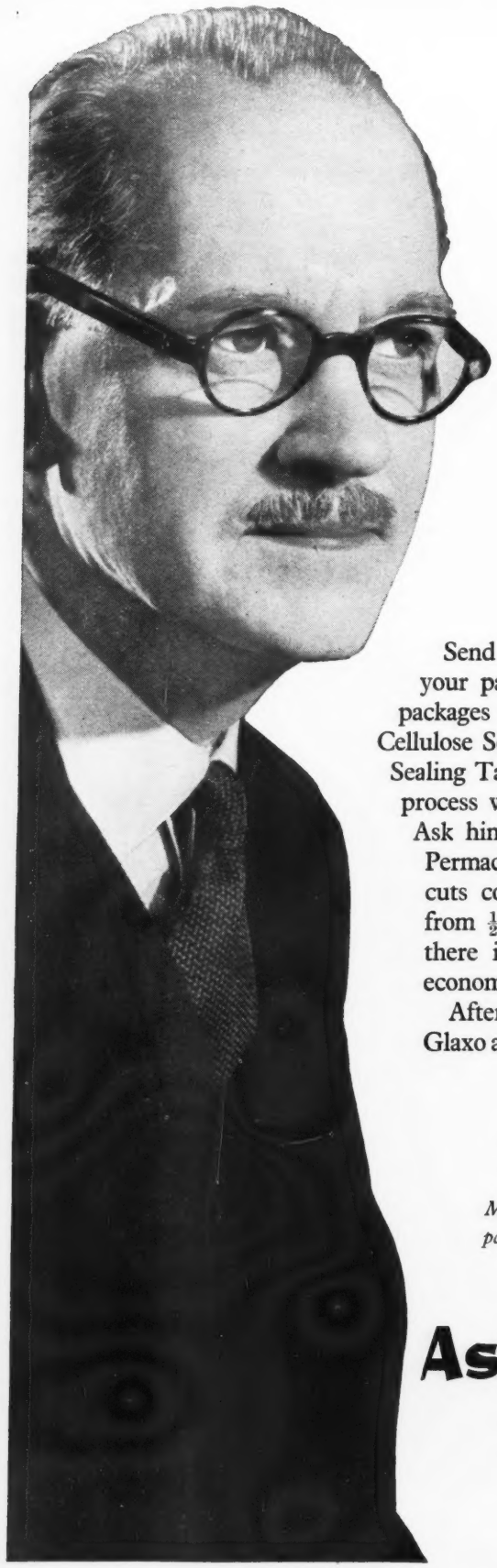


Top: A large 'L' type stoker with twin travelling grate during installation.

Below: Hand operation of small 'L' stoker grate during erection.

C13



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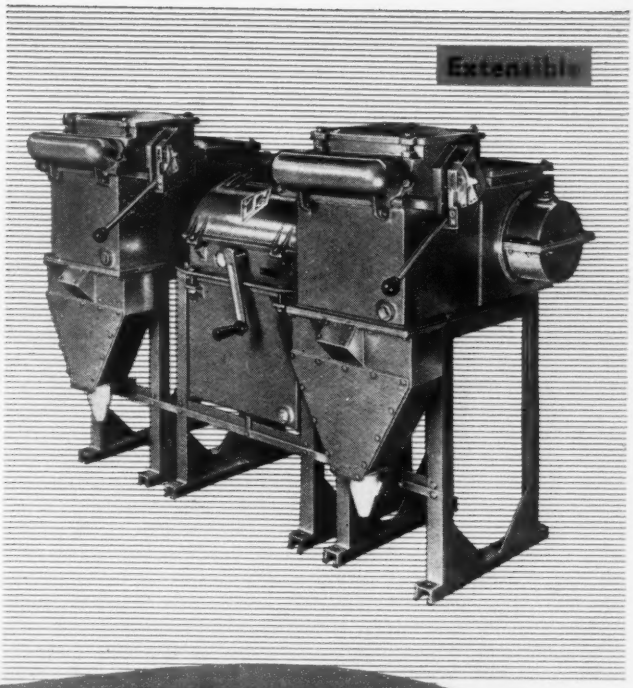
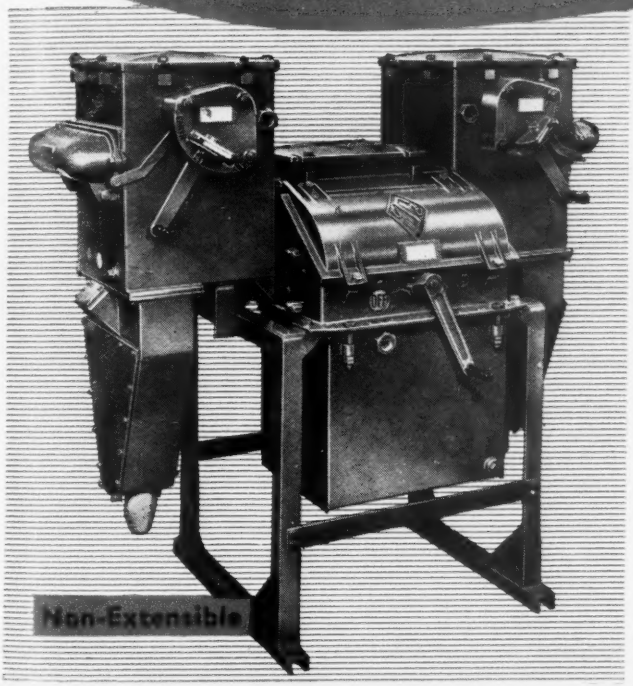


H.V. FUSE SWITCH EQUIPMENT



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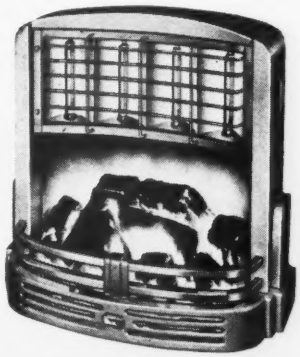

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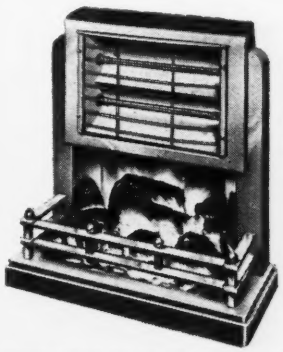

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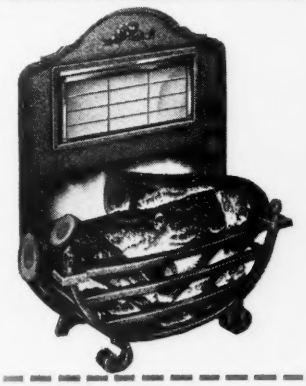

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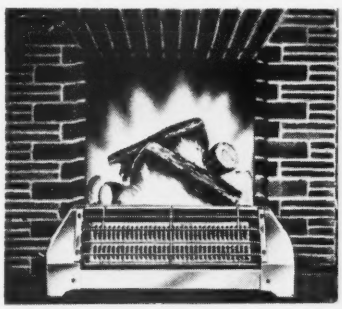

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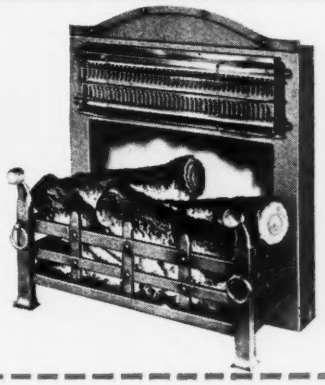

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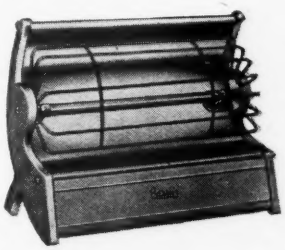

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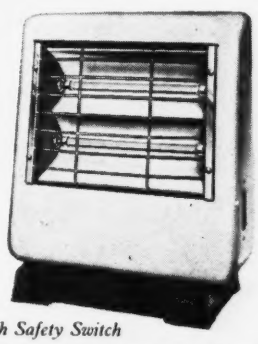

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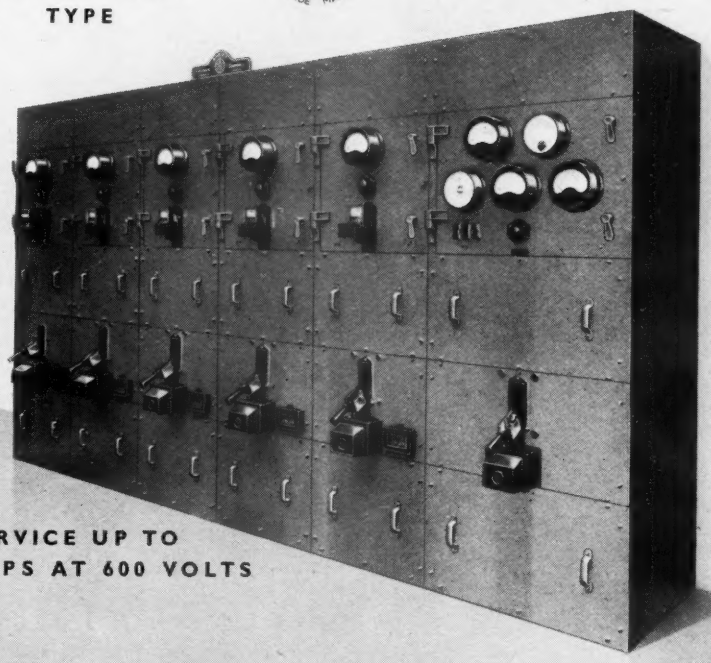

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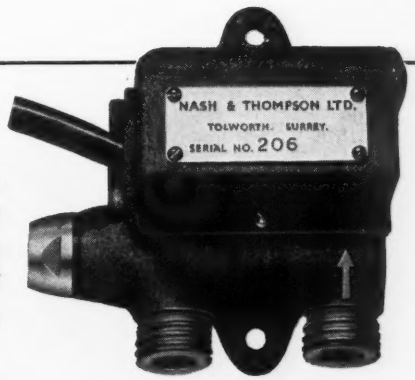

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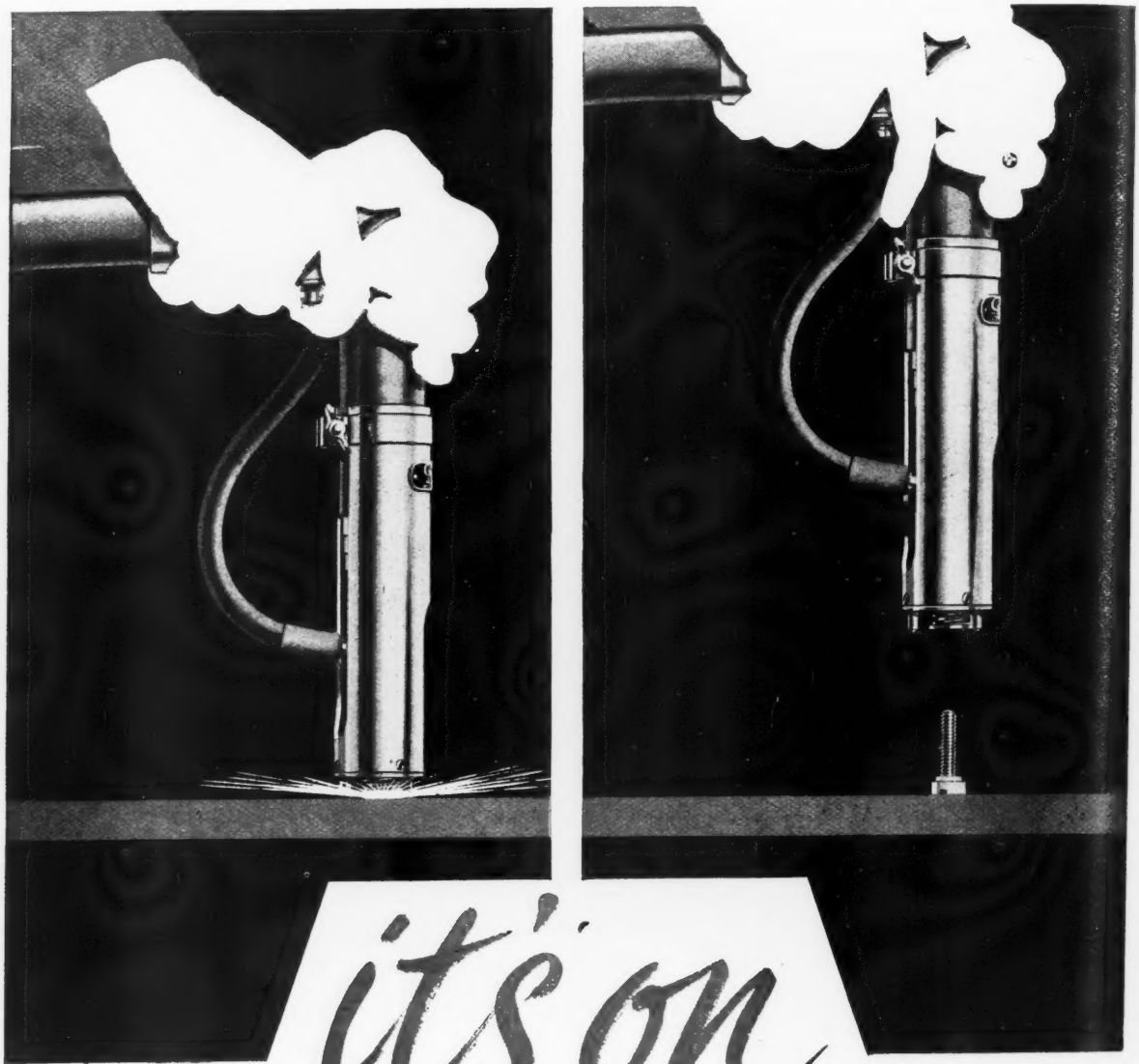

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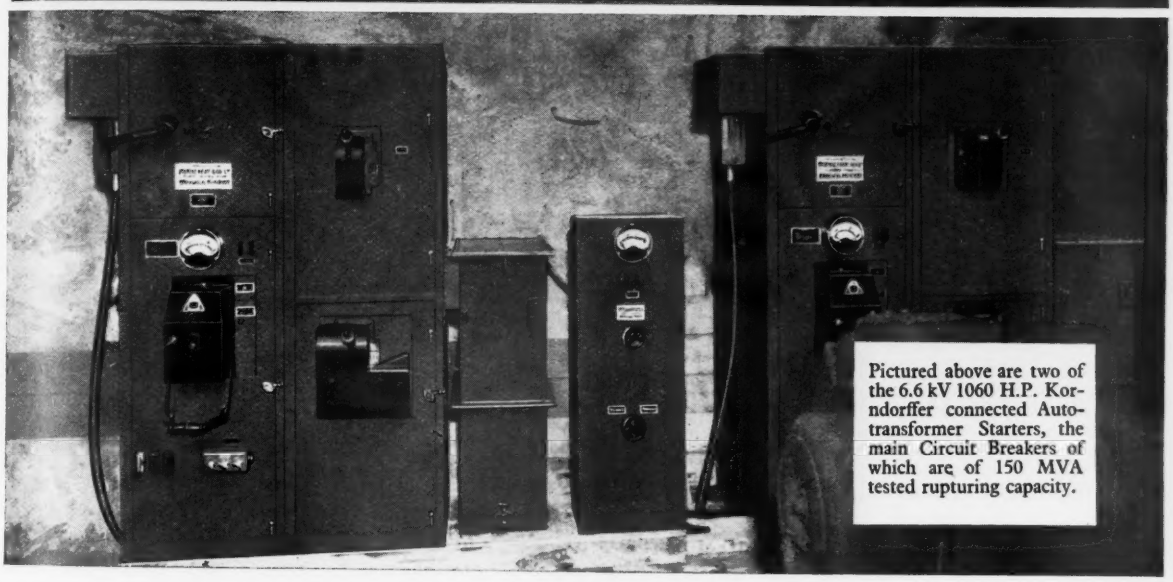

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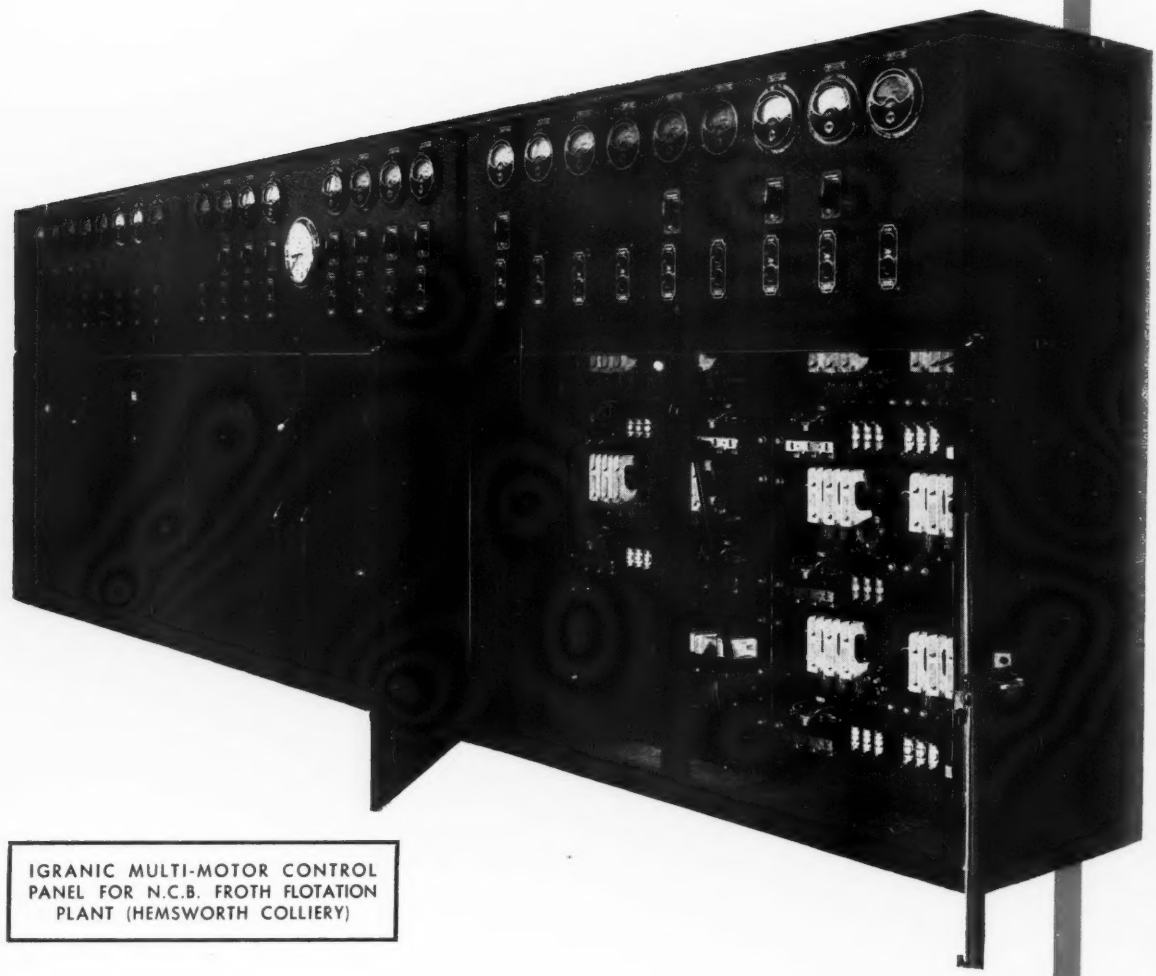

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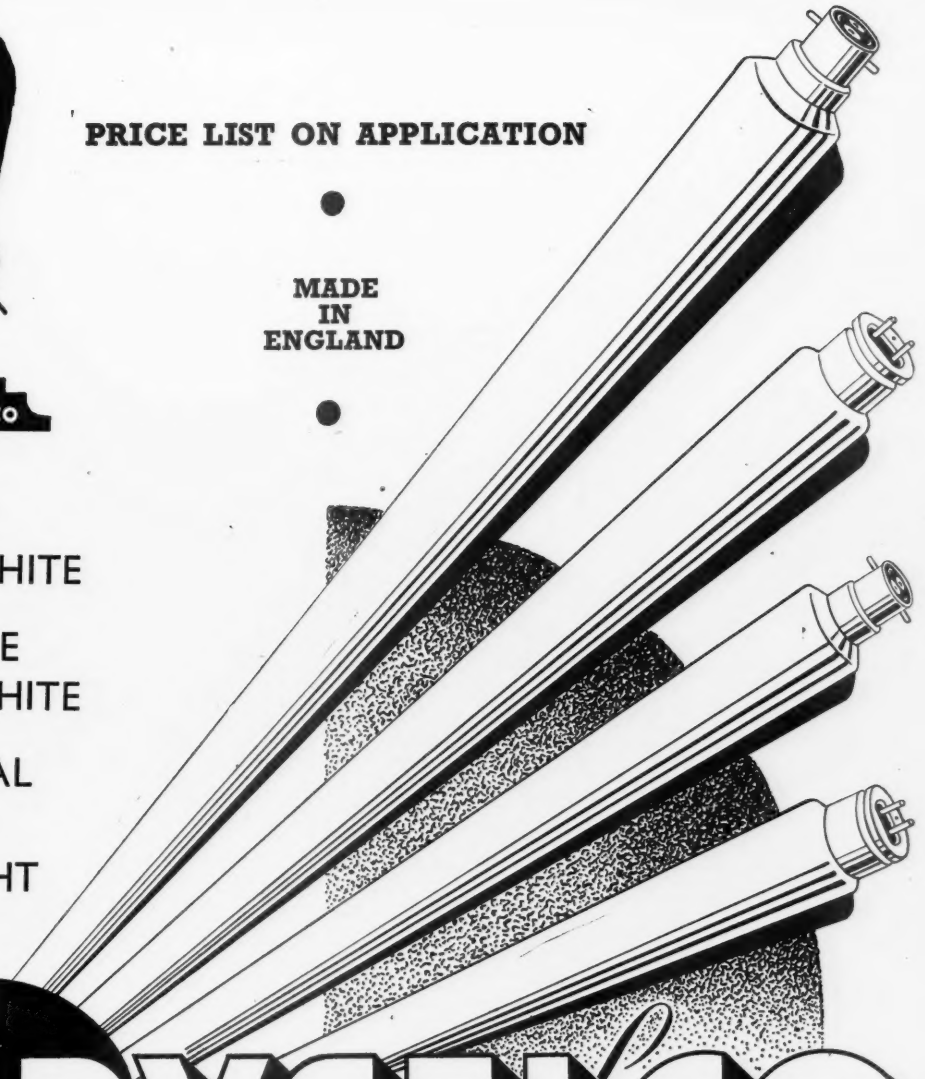

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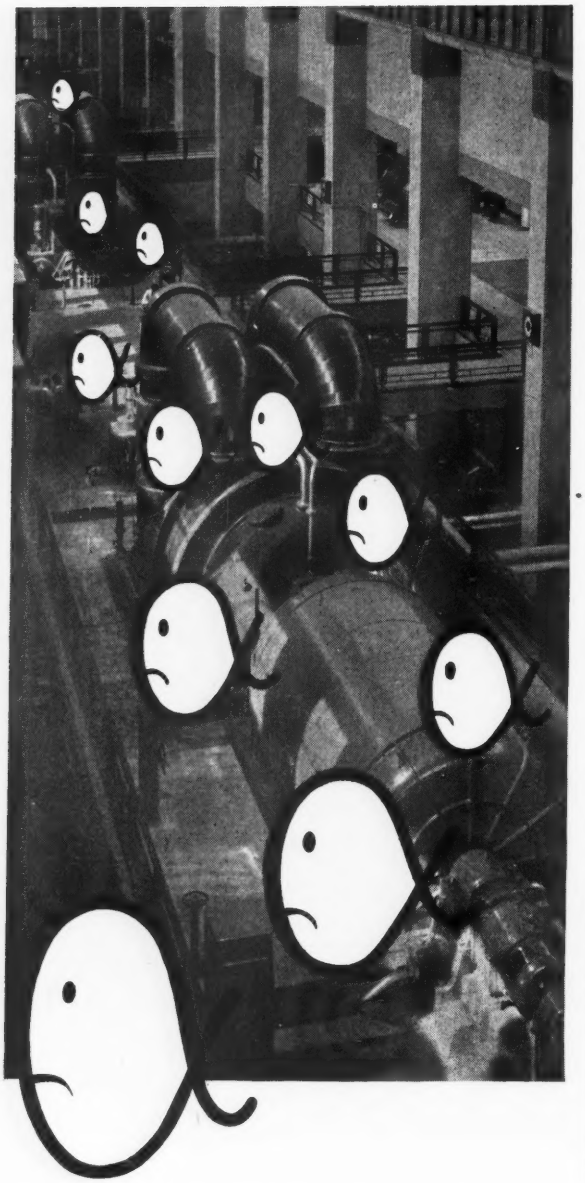

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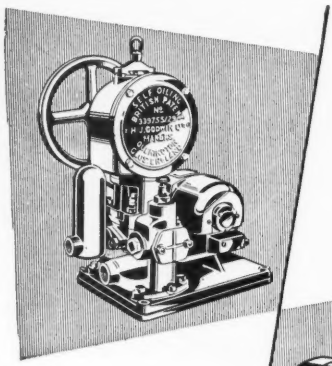

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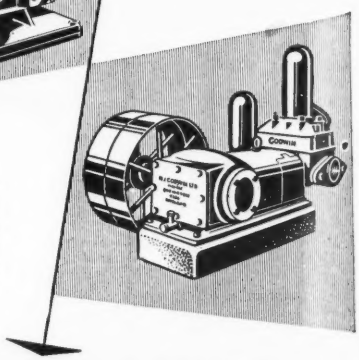

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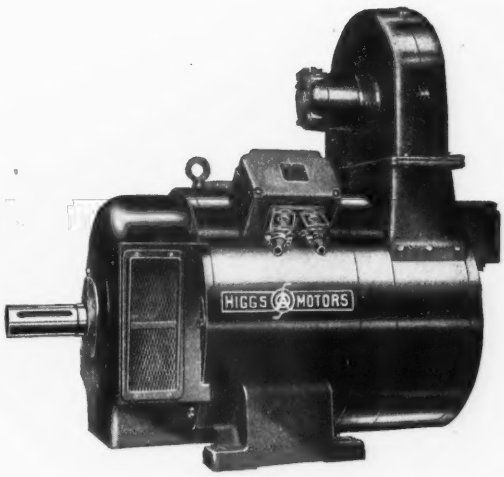

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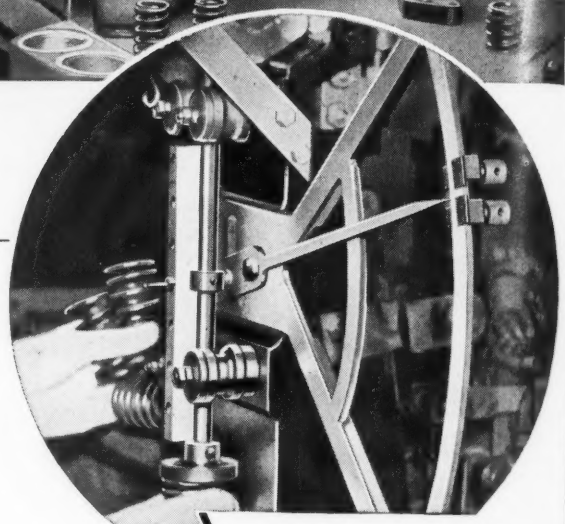

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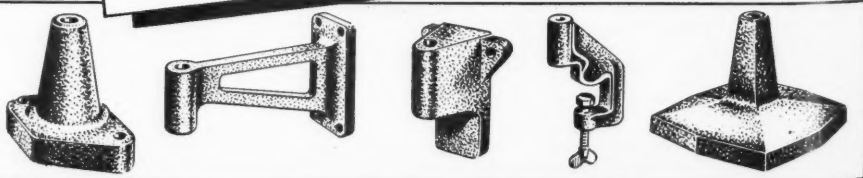

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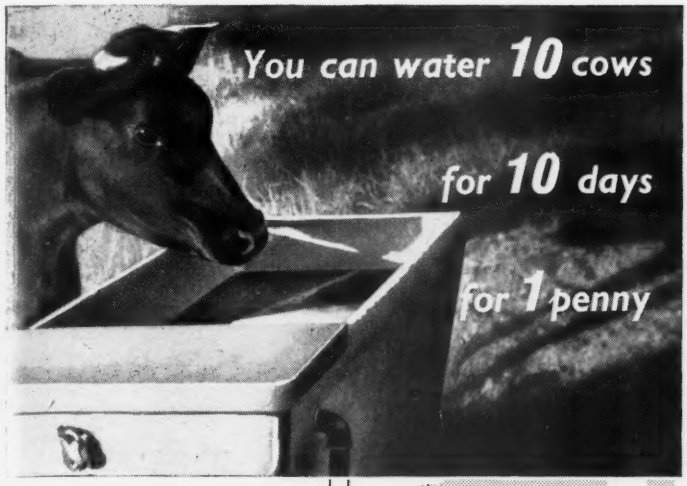

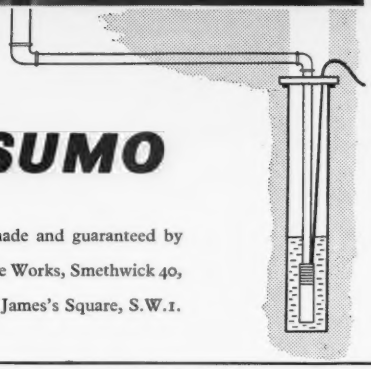

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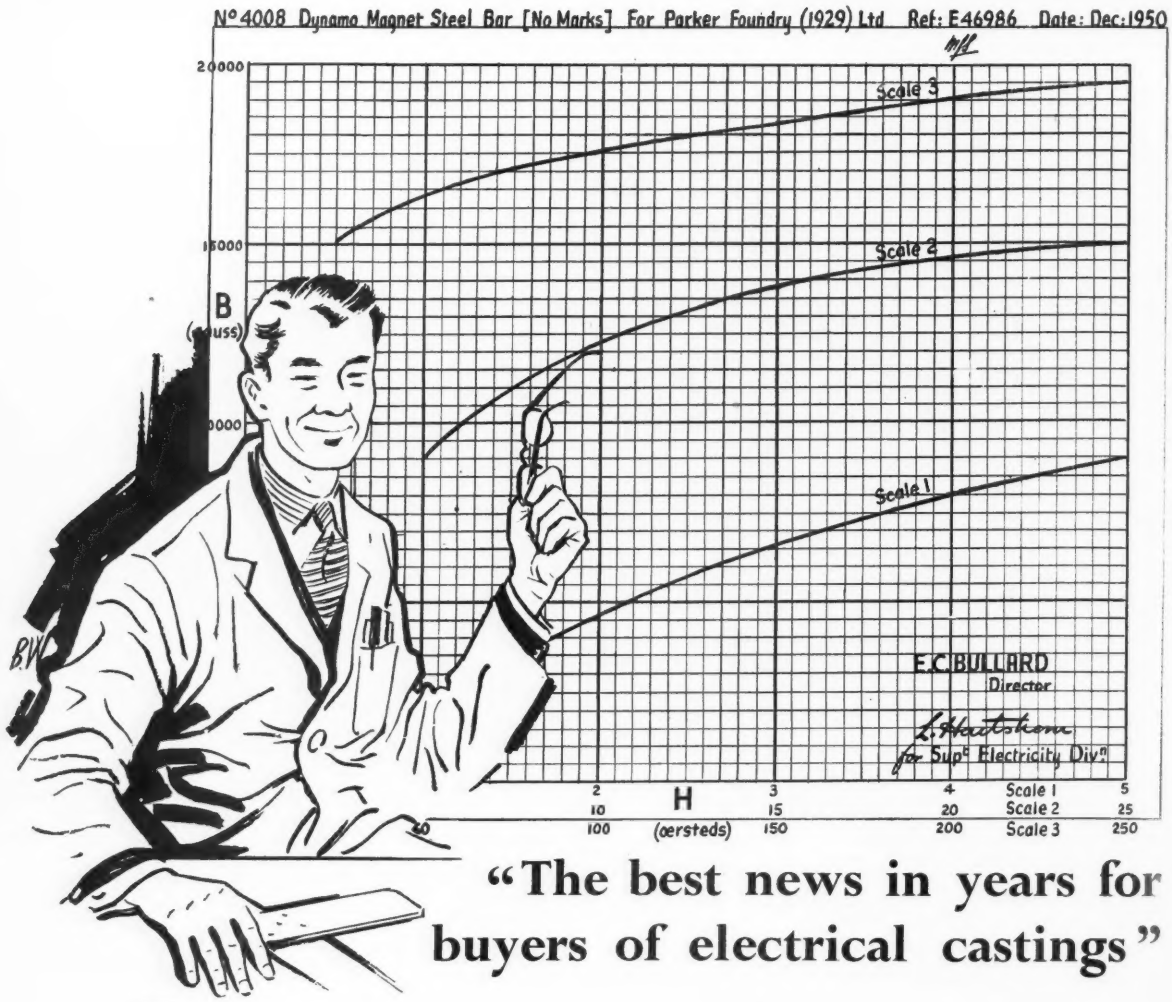

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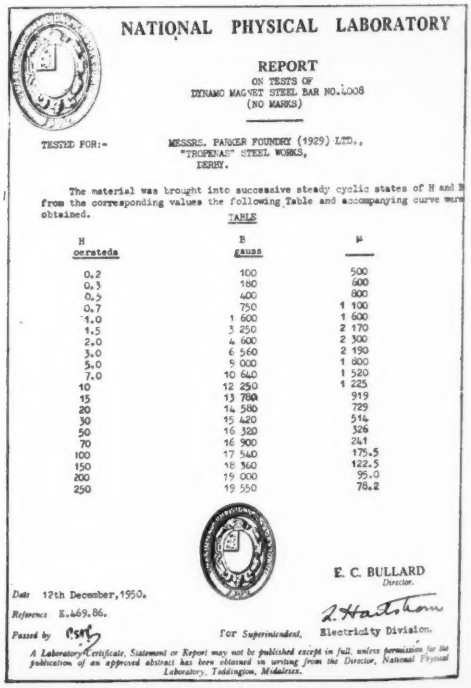

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0.3	180	600
0.5	400	800
0.7	750	1 100
1.0	1 600	1 600
1.5	3 250	2 170
2.0	4 600	2 300
3.0	6 560	2 190
5.0	9 000	1 800
7.0	10 640	1 520
10	12 250	1 225
15	13 780	919
20	14 580	729
30	15 420	514
50	16 320	326
70	16 900	241
100	17 540	175.5
150	18 360	122.5
200	19 000	95.0
250	19 550	78.2

E. C. BULLARD
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Date 12th December, 1950.
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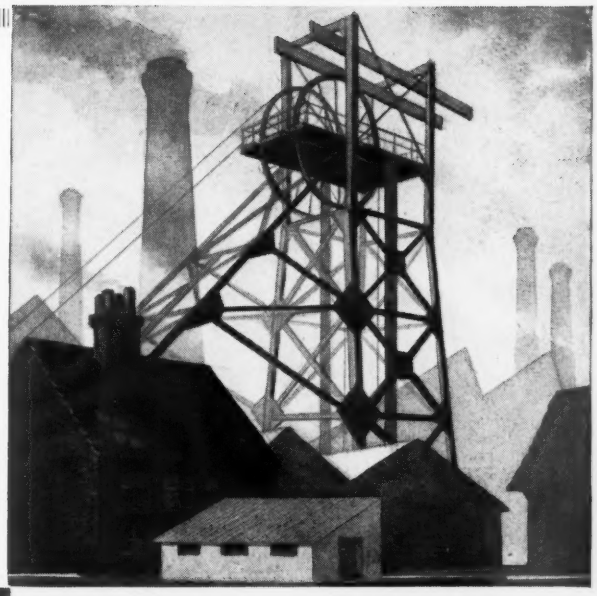

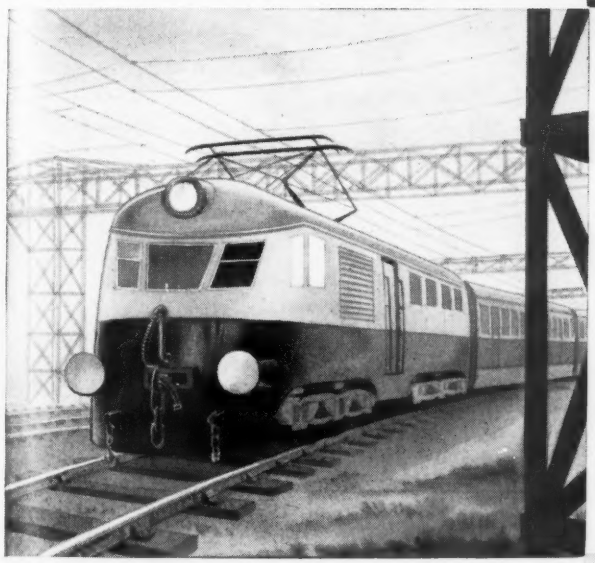

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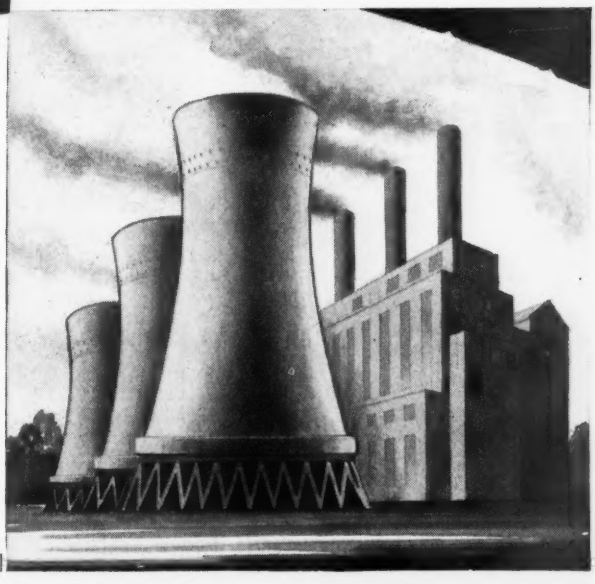

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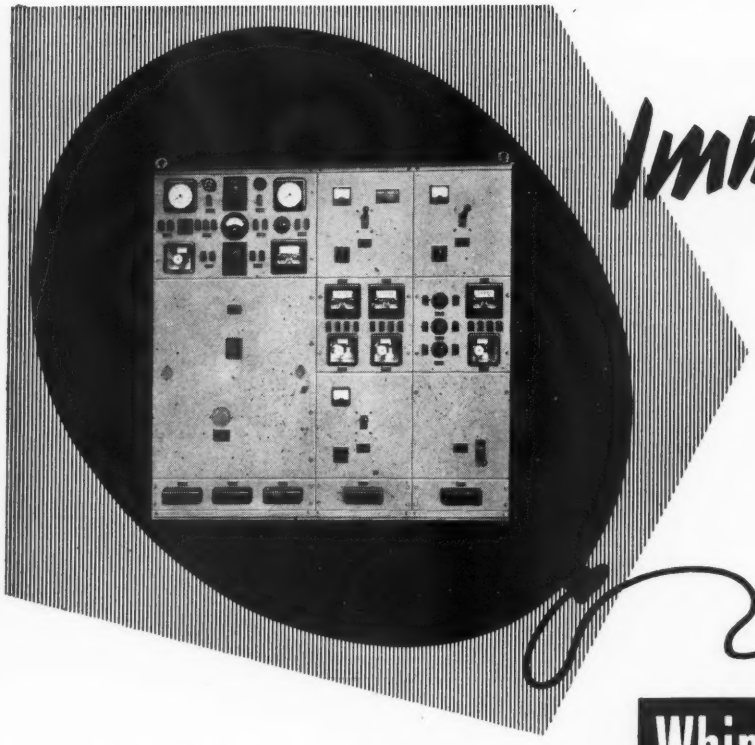

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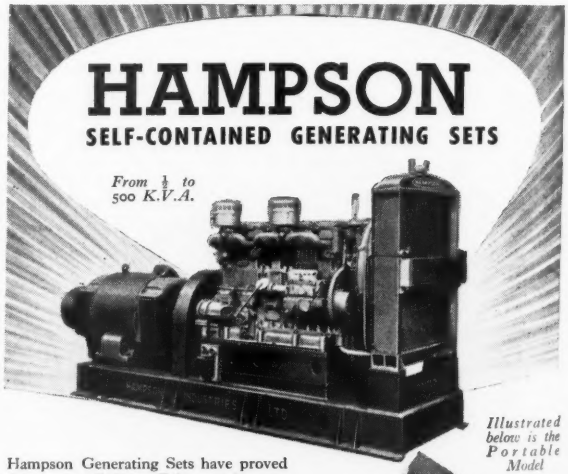
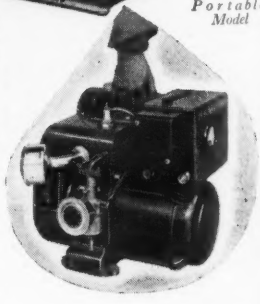


Illustrated below is the Portable Model



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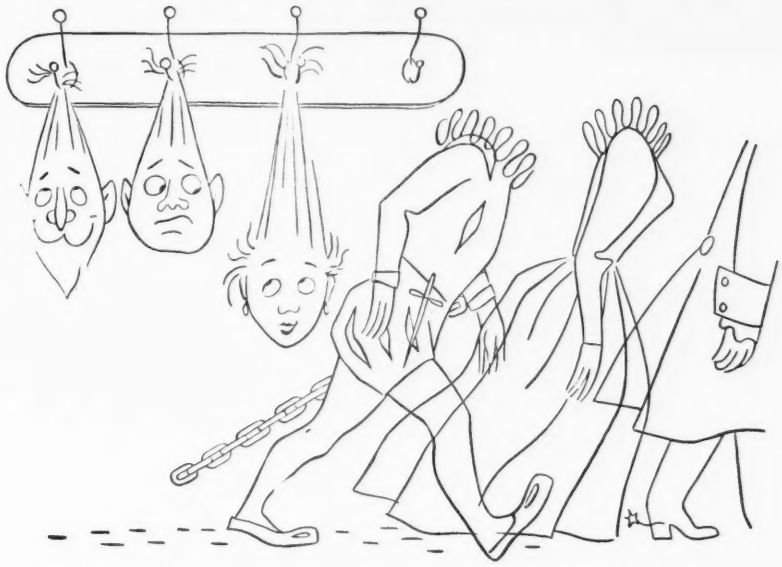

NOT only unfunny! A rather horrific picture! When we said "detachable pick-up heads" surely the artist must have known we meant "detachable pick-up heads" not . . . anyway, we are sure *you* understand we meant the detachable high fidelity pick-up heads supplied with our latest radiograms.

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(P.361C)

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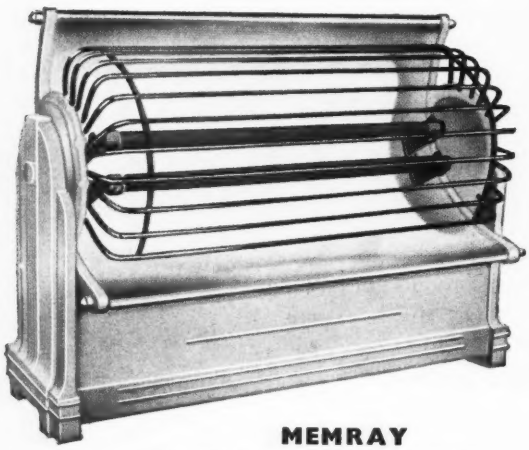

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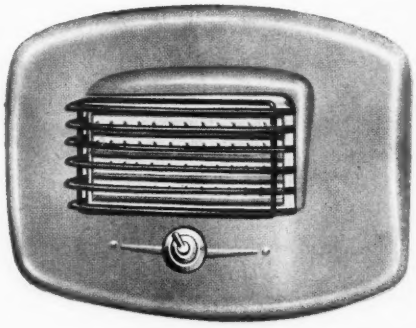

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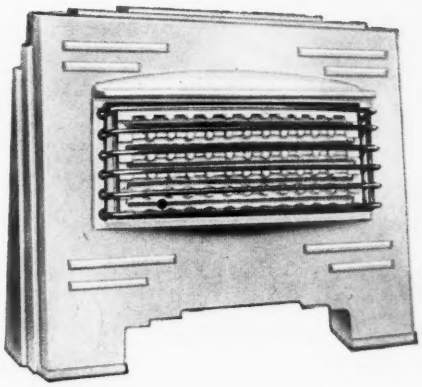

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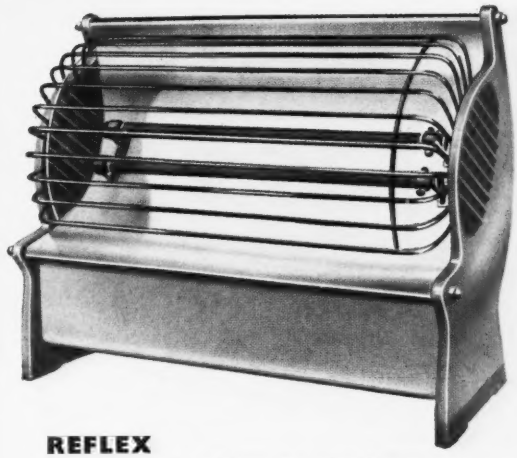

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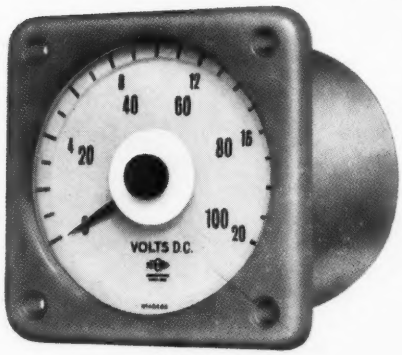

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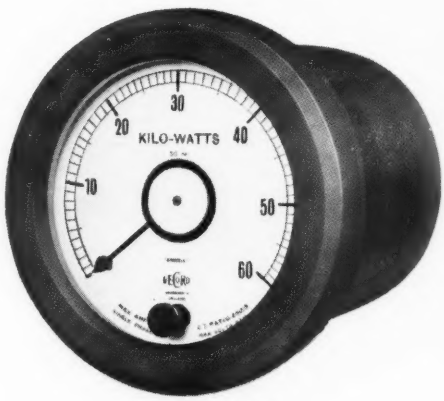

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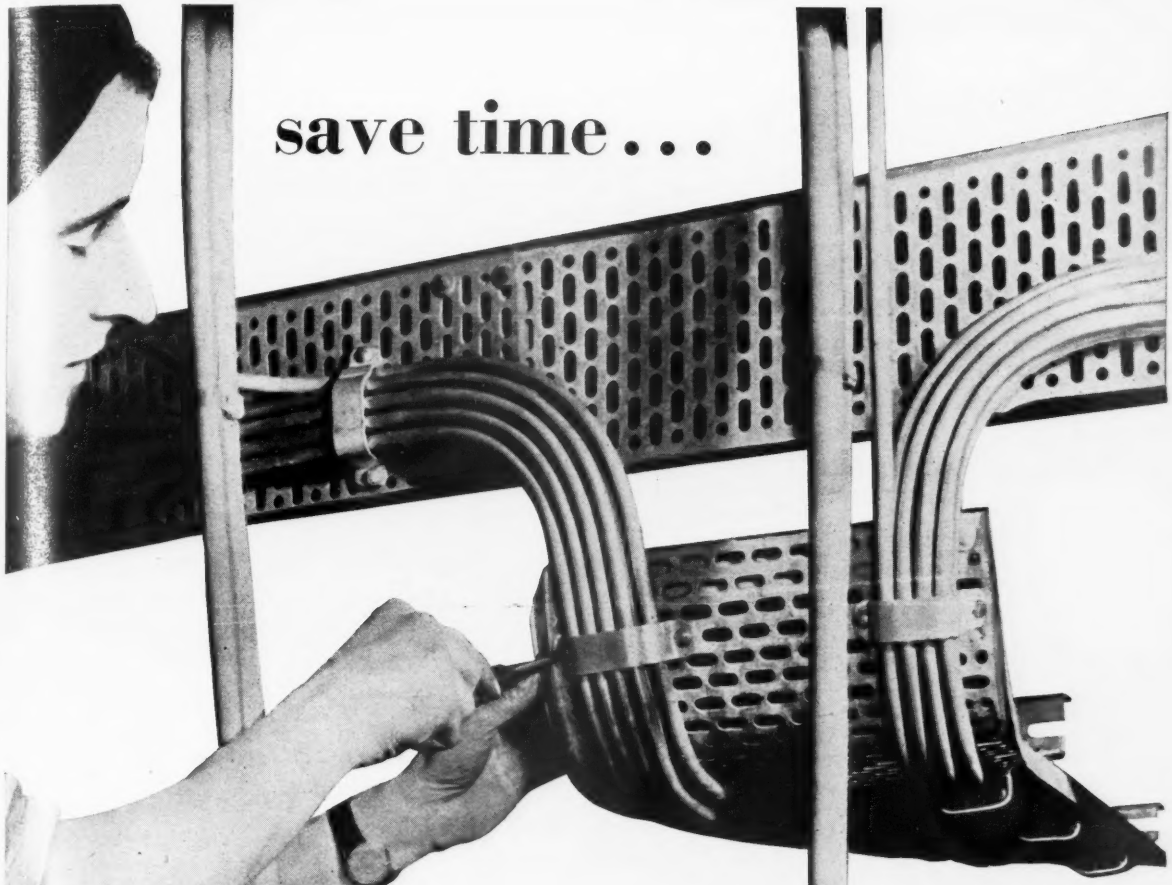

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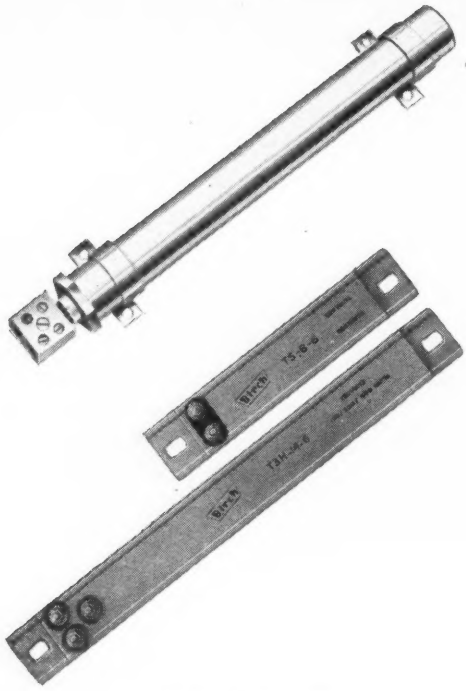

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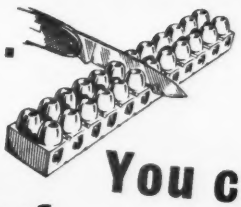

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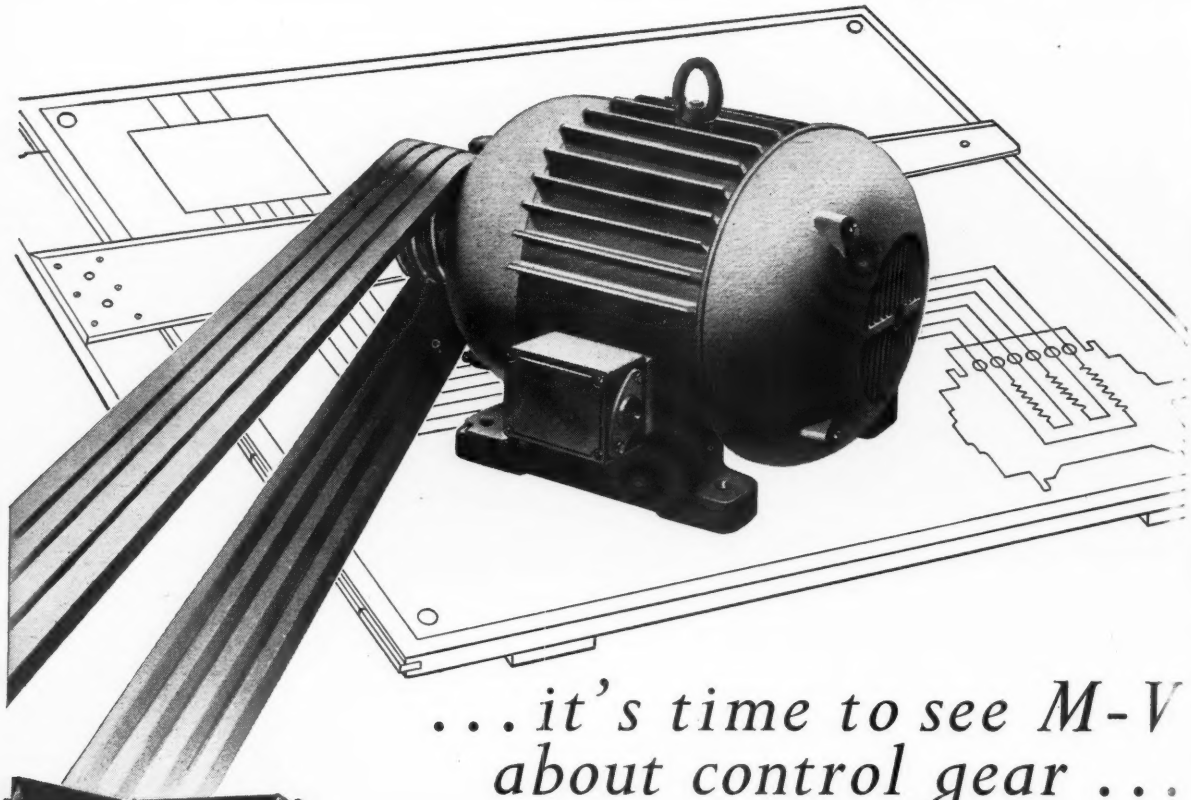

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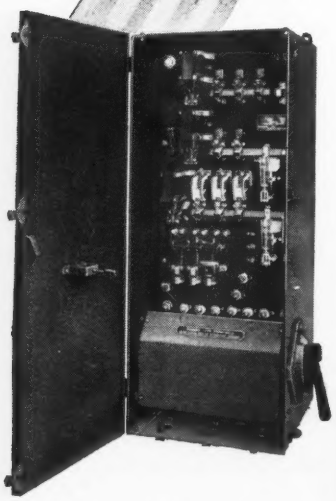

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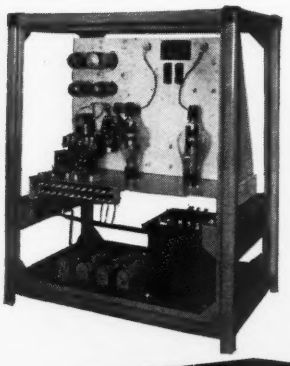

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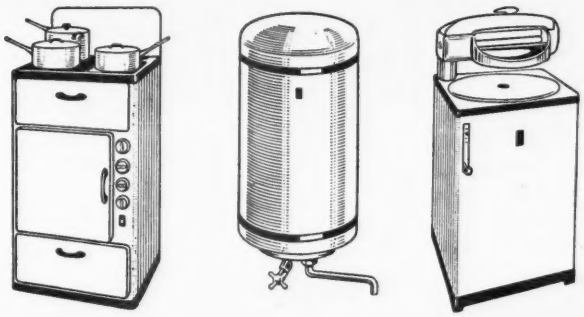

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10 SEPTEMBER 1954

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VOLUME 155 ◇ NUMBER 11

Eighty-Second Year of Publication

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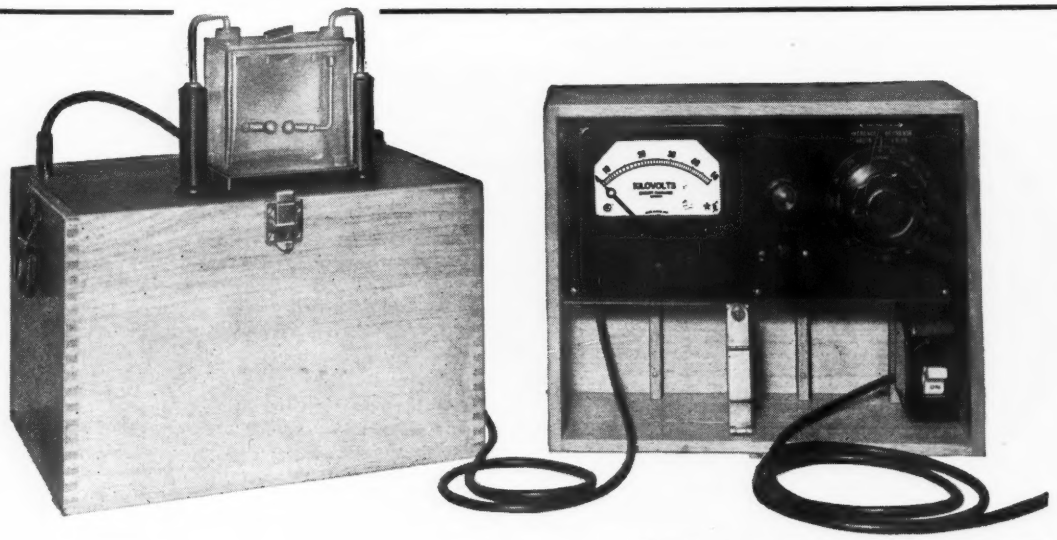

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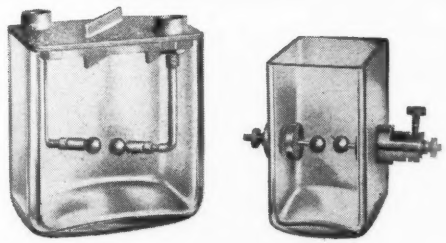

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ELECTRICAL REVIEW

10 September 1954 Vol. 155 No. 11 Established 1872

Engineering Materials

IN defining one function of engineers as the economic exploitation of the properties of materials, Dr. Willis Jackson at the British Association meeting drew attention to the extent to which progress is increasingly due to this application of scientific principles. Of the two lines of approach open—improvements in existing materials and the search for new ones—while the first is generally of more immediate importance, the other has a vital bearing on certain prospects for the future.

An example of evolutionary development cited is the continued use of paper as insulation for power cables (despite the recent introduction of new synthetic materials) which, as a result of technical advances in manufacturing processes and components, still provides the only means of withstanding high voltage stresses. On the other hand the discovery of a new material, polythene, revolutionized the outlook in regard to low voltage submarine cable for communications. Another instance, of the utmost importance to the future generation of electricity in atomic power stations, is provided by the need to make extensive use of scarce metals, new to engineering, such as are required for encasing nuclear fuel, for which low neutron absorption coupled with ability to withstand high temperatures is essential for efficiency. In this respect the presidential addresses to the Engineering and the Physics Sections of the British Association may be regarded as complementary, as in the latter Sir John Cockcroft discussed recent developments in nuclear physics which determine the basic factors of reactor design. The information he gave could give no more than a hint of the part played by patience as well as by brilliance of intellect, thus linking it to Dr. Willis Jackson's reminder that the needs of man can no longer wait upon chance discovery or ingenuity alone. Results, he pointed out, must be evolved logically by the human brain from natural science.

Chance discovery cannot be altogether ruled out. Polyethylene, for instance, was discovered during researches for quite a different purpose, but significantly such chances throughout the history of fruitful scientific discovery appear to have come only to those whose previous work had qualified them to appreciate the implications of new ideas. The mental training to be derived from studies that are not wholly technological gives an ability to use knowledge, and this factor may for the present purpose be classed among new engineering materials. This seems to follow from the argument advanced in the inaugural presidential address to the Association of Dr. E. D. Adrian. Whether or no human brains differ fundamentally from those of remote ancestors, they have surely been modified by an ever widening background of training and experience, which has become possible through the power that has been acquired by engineers over the forces of nature.

SANDS OF DEE

A substantial proportion of the new generating plant being brought into commission this year is in the area of the B.E.A.'s North West, Merseyside and North Wales Division. Altogether some 400 MW is expected to be added. One of the Division's new stations, to be officially opened next week, although it has in fact been in operation for some months, is at Connah's Quay on the estuary of the River Dee. Besides adding to the nation's power resources the new station will contribute in a small way to the reclamation of the sandy waste made famous in Charles Kingsley's tragic ballad. Boiler ash from the station is to be deposited on 30 acres of marshy ground and the Flint Borough Council has another scheme for tipping household refuse on a 70 acre site. In this way the land will be raised about 8ft above tidal level and, states a correspondent of the *Liverpool Daily Post*, the result will be ultimately to provide good grazing land, public gardens and further industrial sites.

POWER PATTERN

Besides Connah's Quay, the Division's programme for the current year covers generating sets at Blackburn, Bold, Carrington, Chadderton, Ince and Roosecote. Thereafter, according to a recent statement by Mr. A. R. Cooper, the divisional controller, there will be a " dip " in the Division's new plant for three or four years and by 1960 it may have to " import " power to the extent of 200–300 MW. During that time the concentration of new plant mainly in the coalfields will mean large extensions in the Midlands. Subsequently the spearhead of the drive for more power may return to the North West, for it is there that the first atomic station is to be situated. Incidentally, as Mr. Cooper pointed out, the Division can claim to have " pretty well everything " in the way of power resources. The first pumped storage hydro-electric scheme is proposed to be undertaken at Blaenau Festiniog and the first B.E.A. wind power generator will be erected at Anelog, also in North Wales, if the necessary site can be obtained.

TWO CITIES

Londoners are shortly to be called upon to pay still higher fares on their public transport services. They will also have to " swallow " more and more diesel exhaust fumes because, on the grounds of greater flexibility of operation, trolley-buses are gradually to be replaced by motor buses. Contrast with this the position in Glasgow. There the question is not one of increasing fares, but whether it would be prudent to *reduce* them. Mr. E. R. L. Fitzpayne, the general manager, points out in his latest report that while the Corporation Transport Department has had two good years and can look forward to another in 1955, it only requires " one further twist of the inflationary spiral " to offset any surplus. On future policy he declares that the Transport Committee cannot lightly think of abandoning electric traction. In this connection he draws special attention to the very satisfactory results of the trolley-buses and suggests that, wherever possible, this section should be developed and extended. In Glasgow, it would seem, emphasis is placed more on the needs of the public than on operational difficulties and " flexibility."

HELPING THE HARVEST

One effect of the exceptionally wet summer experienced this year is likely to be a still more insistent demand from farmers for the speeding up of rural electrification. A statement issued by the British Electrical & Allied Manufacturers' Association tells how one particular type of electrical equipment—the grain dryer—is being called into use to save the harvest. Fortunately many farmers were already prepared; at the beginning of the year 3,500 grain dryers were in service compared with 2,400 twelve months before, and in the first half of this year nearly a thousand more were delivered. In the last four weeks orders have been trebled, many farmers sending their own transport to London to collect the dryers so as to save time. Electricity Boards, too, are co-operating in providing the increased electricity supplies urgently needed. Thus the harvest is being saved from what, in former years, would have been almost complete ruin, for wet grain cannot of course be stored.

FIREDAMP AS FUEL

The possibility of using methane derived from firedamp as fuel for the generation of electricity was mentioned in the annual report of the British Electricity Authority. The amount available varies widely from pit to pit. In some the quantity is negligible. In others, as Dr. J. H. Jones and Mr. J. G. Bromilow showed in the paper they presented before the British Association (Engineering Section), it results in considerable loss of coal output and waste of power in ventilating plant. The heat equivalent of the potential methane output of British collieries (estimated at 8,000,000 tons of coal per annum) would represent, as Lord Dudley Gordon (who presided) pointed out, a considerable proportion of the deficiency of 20,000,000 tons of coal per annum in about ten years' time which Mr. Gunn had mentioned in a previous paper on steam generation. The amount of gas available at any pit would be likely to vary from time to time, thus providing scope for local dual-fuel diesels, the subject of another paper by Mr. J. R. Simonson, or perhaps by the development of transportable gas turbines.

LIGHTING FOR PRODUCTIVITY

Next week's issue of the *Electrical Review* will be devoted particularly to industrial lighting, especially from the point of view of increased productivity. Subjects to be dealt with in addition to the general question of adequate and correct illumination include the effect of lighting on steel production, fluorescent lamps for high bay lighting and fittings for use in hazardous situations

Power System Analysis

A Review of Needs and Methods

By G. LYON, M.Sc. (Eng.), A.M.I.E.E., Mem. A.I.E.E.*

SINCE the war the installed capacity of generating plant in the United Kingdom has risen by over 7,000 MW, at a capital cost of around £500 million. The total cost of the networks required to take this power to the consumers is difficult to determine, but it is of comparable magnitude. These are large sums, and it is natural that more and more attention has been devoted to ensuring that they are spent to the best advantage. Now that the capacity of British generating stations has been raised sufficiently to meet the peak demand, the transmission and distribution systems require strengthening at many places and a great deal of attention is being given to the problems involved.

As well as growing in size, power systems are becoming continually more complex, so that it is more difficult to ensure economical construction and efficient operation; the full benefits of striving for these qualities in generating stations are not obtained unless similar efforts are devoted to transmission and distribution. Power system engineering, in the full sense, is a broad field of study embracing technical, economic, and at times political considerations, and extending from generating station to consumers' apparatus. More particularly, it endeavours to ensure that the plant and apparatus of an electrical power system shall be technically and economically suited to the duty likely to be imposed upon it. To this end detailed analysis of prospective conditions in systems is required, and interest in aids to speedy analysis has been mounting. Since there are usually several promising solutions to a system design problem, selection of the best often necessitates the full analysis of various conditions upon each. Similarly, certain types of analysis have become important in the daily operation of systems, provided the results can be obtained quickly enough.

In this article the principal analytical problems and the present methods of tackling them are discussed under four headings, dealing with load carrying, power and voltage control, protection and stable operation. The importance of each of these groups varies from one system to another, but all systems are affected by these problems in some degree.

Load Carrying

The estimation of future loads is often a difficult and contentious business, but must be done. Fortunately it is usually safe to base design upon assumed blocks of load and then adjust the installation programme to suit actual growth of load.

The reinforcement or extension of l.v. distribution networks is usually fairly easy to carry out, and the feeder sizes required for load current or voltage drop requirements on radial or simple ring mains are readily calculated. It is much more difficult to decide what plant should be provided for future growth at present cost, and opinions on this subject vary considerably.[1, 2] On higher voltage systems the local variations are diversified, and the total growth of load in industrial communities tends to follow an exponential law. In virgin territory electrification may pick up large amounts of load from previously "frustrated" consumers, so that the initial rate of growth may be very high.

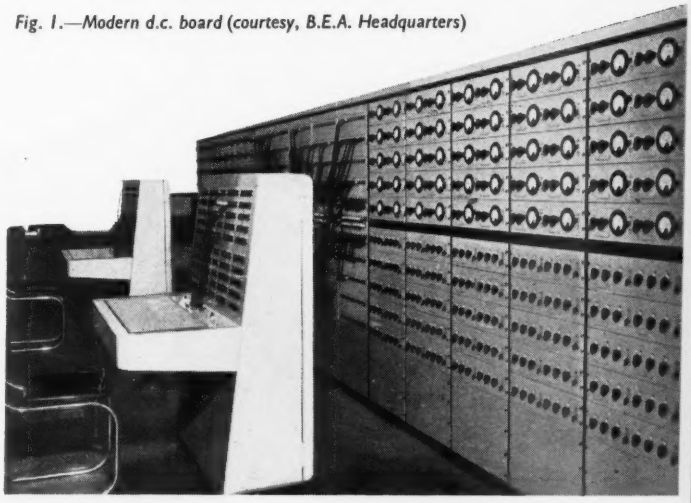
As soon as a distribution system becomes appreciably interconnected the calculation of the load distribution becomes time-consuming unless a simplified method can be used. Fortunately this is usually possible.

Loading of Distribution Systems

Distribution systems range from the final l.v. distribution to quite complicated networks at higher voltages. On the simpler systems the operating conditions are readily calculated, but where there is substantial interconnection and especially when both overhead and underground sections occur, the arithmetic becomes tedious. Various short-cut methods are in use,[3, 4] mostly depending upon the assumption of similar X/R ratios in the branch impedances, using the superposition of partial solutions, and solving for power or current distribution in the first place. A separate solution may be obtained for reactive power distribution, if necessary. Once the load flows are determined Forrest's charts[5] often provide a quick means of obtaining the voltage distribution.

Analyses made in this way may have errors of 10 per cent or so in power, and perhaps 3 per cent in voltage, which is close enough for the preliminary comparison of performance and costs, and many other purposes. However, it is usually necessary to have a series of load pictures for various conditions, and a d.c. board, or resistance analyser, is of great help in saving time and reducing the arithmetic, which is the major source of human errors. Modern d.c. analysers are usually dual-purpose, being designed for both load and fault studies, but earlier models were often designed for short-circuit studies only. A typical modern board is that recently installed by the B.E.A. in Bankside House, and shown in Fig. 1.

Fig. 1.—Modern d.c. board (courtesy, B.E.A. Headquarters)



* Merz & McLellan.

With the aid of such an analyser, and employing two set-ups of the system combined with a good deal of intermediate computation, it is possible to obtain a full solution for MW and MVAr with the system impedances properly included, by a method due to Hahn.[6] However, the method is cumbersome and hardly suited to everyday use. Enns[7] has developed a more elaborate form of resistance analyser, using a.c., to provide full load-flow solutions more directly; his analyser is intermediate in cost and convenience between the usual d.c. board and the full a.c. network analyser.

Loading of Transmission Systems

There is no very clear distinction between transmission and distribution systems and the first may become the second due to load growth. For present purposes a transmission system may be taken to include generating stations and load points widely separated and interconnected in a multiple manner by networks at different voltages including transformations from one to another. Such systems are becoming increasingly common, and they often afford important economies in standby plant compared with electrically simpler schemes, but the operation is by no means easily understood.

The loading conditions of a " straightaway " transmission from generators to load, even over great distances, can be found by means of calculations or charts using seven-figure logarithms or a desk computer. Such means are inadequate for more complicated systems, and the most practical technique evolved so far is the model circuit, or a.c. network analyser. By this means the system operating conditions can be simulated fairly closely, and changes of loading, generation, system connections, transformer taps, reactive power supply and so forth can be readily investigated. The design of these analysers varies to some extent and a typical modern example is shown in Fig. 2. The author has described its use in more detail elsewhere.[8] It is interesting to note that the number of analysers in service has grown in a similar manner to the world consumption of electricity, and even more quickly, as can be seen from Fig. 3.

Even with the help of the fastest analysers it is difficult to get a sufficiently detailed, varied, and continuous

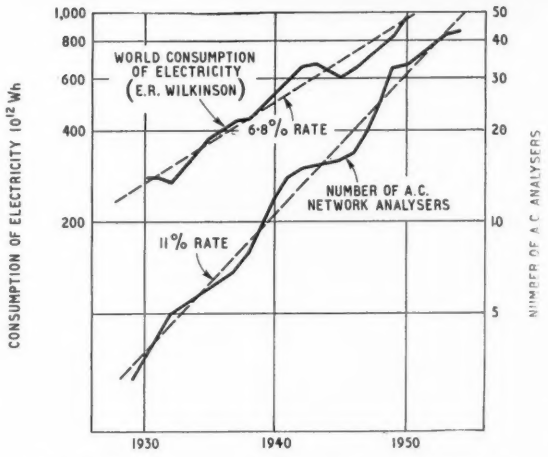


Fig. 3.—World consumption of electricity, and numbers of a.c. analysers

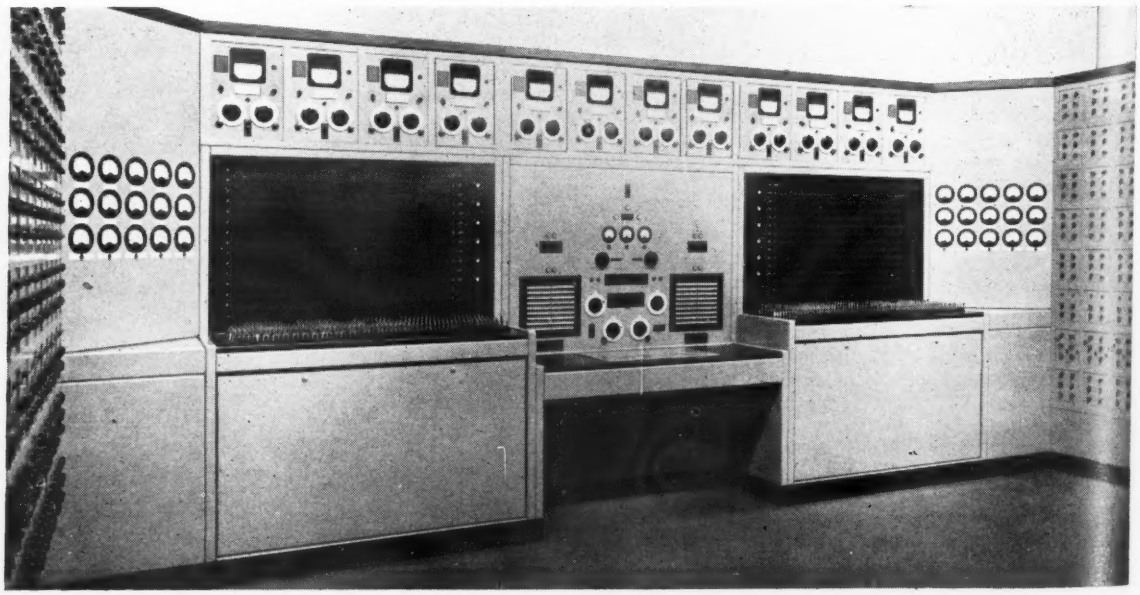
picture of loading conditions to enable operating losses to be reduced to the minimum. The development of new techniques for using a digital computer in conjunction with an a.c. analyser, however, has opened the way to a solution of this problem.

Interesting problems are produced by large individual loads of unusual character, such as arc furnaces and rolling mills. The large fluctuations in the power and power factor of such installations may lead to voltage variations too great to be tolerated on the normal supply system. It may be necessary to employ special feeders isolated from the main system, or coupled through buffer reactors, or to compensate part of the system impedance by series capacitors. If the supply to the difficult load is direct the conditions can be calculated fairly readily; for more complex networks an a.c. analyser is usually employed.

Power and Voltage Control

One of the main arguments for operating systems divided into simple sections is that control of power and

Fig. 2.—A.c. network analyser (Associated Electrical Industries, Ltd.)



voltage is then easily visualized and performed. On the other hand, the amount of standby plant for a given standard of security is increased, and mesh connection is increasingly the rule. Improved means of analysis are therefore required for both planning and operating engineers.

On a uniform system, e.g. all overhead 33 kV, good results are obtained by simple means, such as the d.c. analyser. Parallel connections at two or more voltage levels, however, often lead to substantial errors in the simplified treatments. It is not satisfactory to design tap ranges for transformers, or to determine the ratings of reactive power controlling apparatus, without a full analysis. The most popular analytical aid is the network analyser, but matrix methods of calculation are being adapted to the new digital computers,[9] and when these are available more readily this approach will be a valuable alternative. A large modern digital computer is shown in Fig. 4.

Although analysers are used mainly for planning they are also useful for existing systems where experiments under full load conditions may be difficult to arrange and possibly costly or entail unreasonable risk to supply. The system operating engineer can be provided with copies of the loading "pictures" used for planning, to supply background information. To assist him in the daily operation of complicated systems he could well be provided with at least a d.c. model of the system, in geographical form, on which the effect of forthcoming operations would be tested.[10] It is surprising how little has been done to assist control engineers in this way, as the cost is trivial compared with that of the system.

Protection

System protection is required to minimize the chances of damage due to overcurrents and overvoltages, the former caused by overloads or faults, and the latter by lightning or switching surges or certain kinds of fault. To select the best form of protection for each application it is necessary to make some sort of analysis of the currents and voltages concerned, the complexity of the analyses naturally varying widely.

The application of highly discriminative protective systems requires a knowledge of the maximum and minimum fault currents to be expected, usually for both phase and earth faults. Knowledge of the fault currents is also required for selection of circuit breaker ratings and the mechanical stressing of connections.

In systems of a mainly reactive character resistance may be neglected, leading to much simplified calculations. A resistance-type analyser may be used to reduce the arithmetic of the solution of more complicated networks, the resistance of the analyser of course representing the reactances of the system.

Where substantial amounts of cable are present, combined with transformers, reactors, and synchronous machines, or where a mainly reactive system is resistance-earthed, the results of studies neglecting resistance may contain errors large enough to cause maladjustment of the more precise forms of relay, or the installation of switchgear of unnecessarily high rating. As calculations in complex numbers are susceptible to error and consume much time, it has become usual to employ an a.c. analyser for fault studies in the more difficult cases. By this means the effect of the previous loading upon the fault currents may also be determined: in lightly constructed systems of wide geographical extent this effect can be pronounced.

Almost all fault conditions are studied by means of symmetrical or allied component methods, working upon

Fig. 4.—Typical digital computer (Ferranti, Ltd.)

single-phase equivalent circuits. These are powerful techniques, but they do not eliminate all arithmetic even when analysers are used, as the component results have usually to be combined to give phase quantities. Special auxiliary computers have been developed to do this work. Suitably programmed, the high-speed digital computer seems ideally suited to the routine production of the large tabulations that form the results of system fault analyses. Memory capacity greater than that of most existing computers is required to handle quite normal system studies. These large memories are in course of development for other purposes, and the next few years should lead to substantial progress in this application.

Although the major factor in the selection of circuit breakers is the short-circuit current to be interrupted, other factors include the excess voltage the breaker may have to withstand, or may produce. At the instant of extinction of the arc in the breaker, an oscillatory voltage of relatively high frequency appears between the contacts, tending to restrike the arc. The nature of this voltage depends largely upon the characteristics of the system at the point in question, and since breakers may be sensitive to the rate of rise of the restriking voltage as well as its magnitude, it is important to know what conditions have to be met in practice.

At present the E.R.A. is engaged upon a programme of tests upon B.E.A. substations, and simultaneously in tests upon model circuits representing the stations set up on a transient analyser.[11] The latter comprises an array of adjustable resistors, reactors, and capacitors rather like the a.c. analyser but suitable for higher frequencies, and in fact the E.R.A. equipment was designed to be used for both purposes. This method is much simpler than field tests (and calculation!) but at present not all the characteristics of the system plant are known well enough for reliable modelling, so that field test comparisons are required.

Similar field tests have been made in other countries, notably Sweden, and in time it may be possible to specify restriking voltages as closely as system fault currents. The avoidance of unnecessarily high specified rate of rise of restriking voltage may lead to economies in the application of air blast circuit breakers, since most breakers of this type can be assigned an increased breaking capacity if the RRRV requirements can be reduced.

Mention was made of the production of excess voltages by circuit breakers. In breaking the low-power-factor small currents associated with unloaded lines or transformers a breaker may produce switching surges of several times normal voltage. Since the mechanism of arc extinction is not exactly known these voltages can only be fully investigated in full-scale tests. However, the action of a given breaker, in idealized form, can be reproduced in a transient analyser in order to try the relative effectiveness of a variety of measures to control the overvoltages, thus reducing the amount of full-scale testing. For example, the effect of employing a low resistance in switching an unloaded line is clearly shown in Fig. 5.

Although switching surges have become of increasing importance with the development of circuit breaker arc control on the one hand, and the reduced sensitivity to lightning of systems at the highest voltages on the other hand, nevertheless lightning surges remain the major sources of damaging overvoltage on most systems. The likelihood of flashover on a line of given construction and shielding may be estimated approximately from statistics of lightning for the area, and protective measures designed accordingly. The arrival of a lightning surge at a terminal station, however, produces reflections which may increase or decrease the voltage experienced at various points in the station. The need for particular protective measures such as surge divertors may be investigated only with great difficulty by calculation, but a model set up on a transient analyser greatly facilitates the work.[12] To obtain a reasonably accurate model at surge frequencies it is necessary to represent such things as busbar and connection capacitance and inductance, as well as the major items of plant, so that particularly careful preparation is required.

Stable Operation

All large interconnected power systems contain a number of large synchronous machines (mostly generators) and if these machines are to operate steadily in synchronism the interconnecting system must provide for the exchange of synchronizing power in addition to the load power. This margin must be maintained throughout normal operating changes such as load despatching, voltage variations, line switching, and even faults successfully cleared. When load and generation in each locality are evenly matched and the interconnections are mainly for standby use, these requirements can be met with little difficulty. But when substantial power has to be transmitted appreciable distances it becomes increasingly difficult to provide the margin economically.

On electrically "long" systems various means are available for increasing the effective margin of stable power exchange, or stability margin. The presence of automatic voltage regulation on the generators, if sufficiently rapid in response, has a pronounced effect in reducing the likelihood of machines pulling out of step following sudden load changes or the loss of a major line. Faults disturb the load distribution and tend to make the machines swing out of step, so that rapid clearance of faults by means of high-speed protective relays and circuit breakers is important. On really long-distance transmission schemes the effective length may be reduced by the introduction of series capacitors in the lines.

The best means of analysing such conditions to permit selection of the most economical solution depend upon the layout of the system. In the early stages of a project and sometimes later as well, much can be done by reducing the system to an equivalent two-machine problem for which alternative voltage levels, numbers of circuits, speed of protection and so forth can be simply compared. Steady-state conditions can be calculated fairly simply, and pre-calculated swing curves have been published[13] to facilitate estimation of the critical switching time for retention of stability against faults. By such means a variety of proposals can be sorted out quickly, and the most promising can then be given detailed attention by more elaborate methods.

Until the last few years the accepted method for solving all but very simple transient stability problems was to plot curves of the angular swing with time of the machines produced by some disturbance, making simplifying assumptions and using a step-by-step method on the a.c.

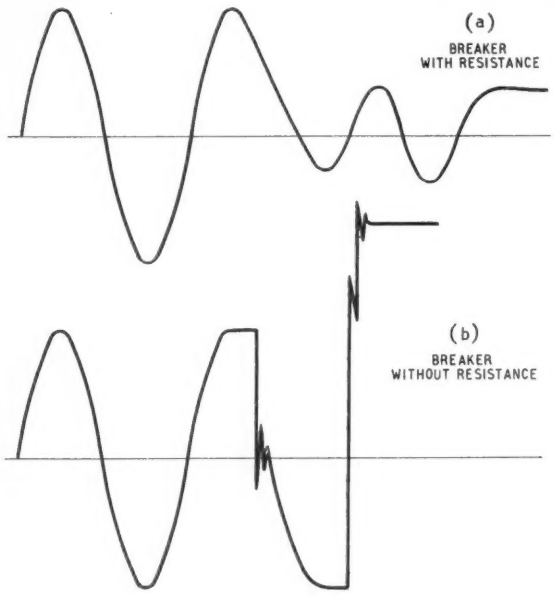


Fig. 5 (above).—Effect of resistance on switching overvoltages.

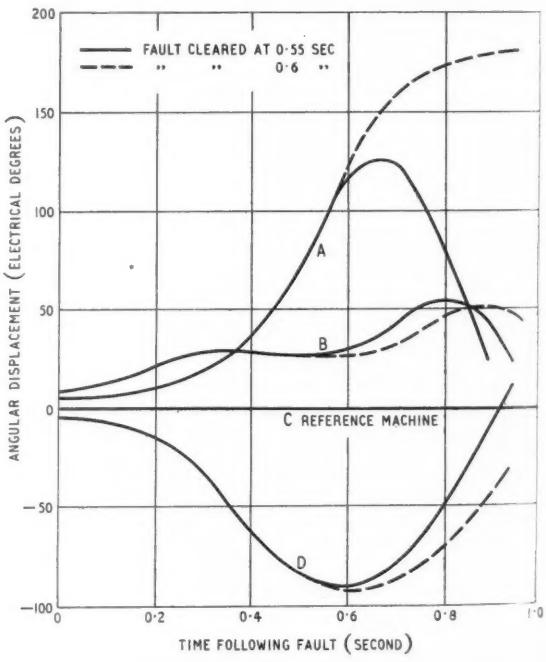


Fig. 6 (right).—Typical swing curves

analyser. The curves produced are of the kind shown in Fig. 6. This is still the usual method, and it is accurate enough for practical purposes but it is tedious. Much attention has been given recently to devising quicker and less laborious methods.

Chronologically the first of these new methods is the "micronetwork" developed by Robert in France. This is a dynamic model containing small rotating machines with characteristics corrected by electronic devices to simulate large machines, and a three-phase four-wire interconnecting network not unlike an a.c. analyser. Switching is done on a timing drum and the curves are displayed on an oscilloscope.

The second method employs the high-speed automatic digital computers now being built in appreciable numbers. Mathematical solutions impossibly time-consuming by manual methods may be done in a few seconds by one of these machines, once the programme of operations has been prepared. A programme for stability studies in general might take a mathematician three months to compile and check, but once made for that computer the programme can be used indefinitely, only the subsidiary instructions applying to each system requiring to be prepared afresh.

Quite recently a third contender has entered the field. Electronic means have been developed for representing the mechanical inertia of the generators, as well as certain other factors, and for varying the time phase of the voltage representing the field of each generator of a network analyser much as is done manually in the step-by-step procedure, but much more quickly. The results may be displayed oscillographically by repeating the solution rapidly, thus producing a stationary image.[14]

It is too soon to judge which of the new methods will be the most successful, but it may be conjectured that in five years' time the step-by-step manual method will no longer be used by any organization seriously engaged in studying stability problems.

Conclusion

It can be seen that the increasing complexity of power systems and the need for economy in time and material have fostered the use of machine methods of analysis, and the trend continues.

Recently it has been suggested that a combined network analyser and digital computer could be used for automatic control of major power systems. The analyser would continuously represent conditions in the system, and the computer, equipped with tables of power station merit ratings and similar data, would calculate the most efficient loading taking into account system losses, signalling the action required. The central control engineers would monitor these operations and exercise over-riding control if necessary. The precise effect of any deliberate change they proposed could be tried out by the machine, in a few seconds, before being put into effect.

The cost of such a device for the British grid, including some additional supervisory equipment, might be £500,000. If it raised the effective annual efficiency of electricity supply by as little as 0·1 per cent it would repay its cost in a few years. In five years' time the reliability of all the apparatus concerned may be sufficient to make the project worth while.

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CARMARTHEN BAY TURBINES

DESIGNED steam and heat consumption figures at various loadings of the six Metropolitan-Vickers turbines at Carmarthen Bay power station, received after compilation of the article in last week's issue of the *Electrical Review*, are as follows:—

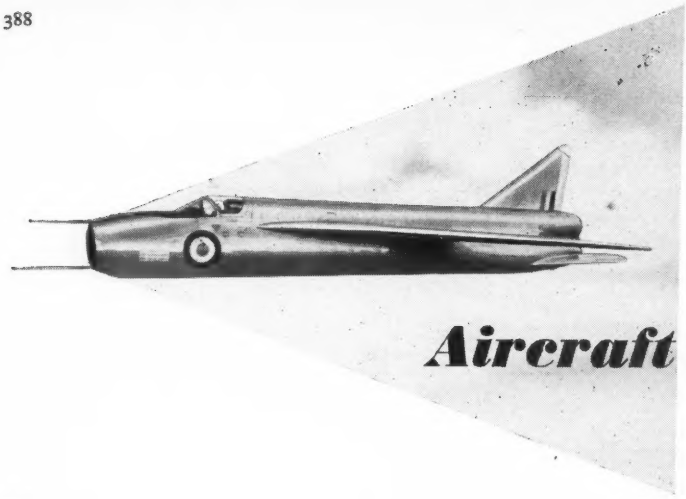
Two 52·5 MW turbines:	52,500 kW	42,000 kW	31,500 kW
Steam consumption, lb/kWh	8·433	8·472	8·604
Heat consumption, B.Th.U/kWh	9,390	9,567·6	9,869·5
Four 60 MW turbines:	**60,000 kW**	**48,000 kW**	**36,000 kW**
Steam consumption, lb/kWh	8·429	8·440	8·516
Heat consumption, B.Th.U/kWh	9,250	9,405·7	9,671

The h.p. cylinders of all machines have eleven impulse stages; the i.p. cylinders consist of fourteen stages for the 52·5 MW sets and thirteen for the 60 MW sets; each half of the double-flow l.p. cylinders has five stages. Blading is of stainless steel throughout. The twin condensers for the 52·5 and 60 MW sets have, respectively, combined cooling surfaces of 52,500 sq ft and 60,000 sq ft, and each condenser can deal with 330 and 377 klb/hr of exhaust steam at a vacuum of 29in Hg (Bar. 30in Hg) with a cooling water inlet temperature of 58 deg F.

French Railway Electrification

ANOTHER stage of the French Railways' programme of electrification of lines in Upper Savoy from Aix-les-Bains with 25 kV a.c. at the industrial frequency of 50 c/s has just been completed with the introduction of electric traction between La Roche-sur-Foron and Annemasse, three miles from Geneva. The voltage on the section from Aix-les-Bains to La Roche-sur-Foron, originally fixed at 20 kV, has now been raised to the 25 kV approved for general adoption by the International Union of Railways.

It is anticipated that the electrification of the La Roche-sur-Foron–Bonneville section will be completed by March, 1955, and of the Bonneville–St.-Gervais-les-Bains–Le Fayet section in 1956. The line from Paris to St.-Gervais and Chamonix will then be electrified throughout.



SURVEY OF S.B.A.C. EXHIBITION AT FARNBOROUGH

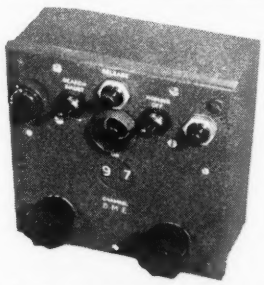
Aircraft Electrical Equipment

THE flying display and exhibition of aeronautical equipment and instruments which is organized each year by the Society of British Aircraft Constructors (S.B.A.C.) is being held this week (7th to 12th September) at the Royal Aircraft Establishment, Farnborough, Hants. There is the usual impressive series of demonstrations of the latest types of civil and military aircraft together with the now well-established " static " exhibition of aircraft engines, components, instruments and various other items relating to aeronautical engineering. Once again this display emphasizes the increasing use and growing complexity of aircraft electrical apparatus, which, with the continued development of supersonic high-altitude machines, has to be made to operate at the highest possible efficiency under extremely arduous conditions.

Apart from a comprehensive collection of both airborne and airfield radio and radar equipment, Standard Telephones & Cables, Ltd., have power rectifier equipment, germanium devices, high grade quartz crystals, radio interference suppressors and airfield lighting control systems. One item on the stand, a precision approach airfield radar, is being demonstrated in operation in the outside equipment display; this equipment provides the ground controller with visual three-dimensional information relating to an aircraft approaching the runway in use.

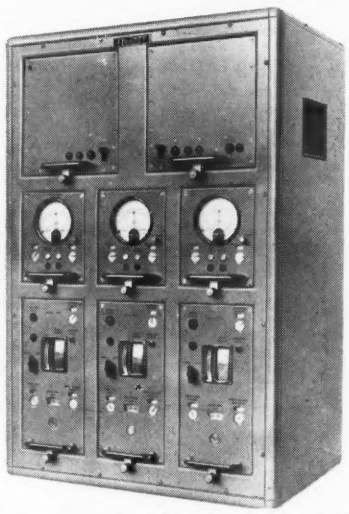
A new medium-sized general purpose electronic digital computor is shown by Ferranti, Ltd., together with a 1,000 Mc/s distance measuring equipment. The latter comprises a single main unit containing transmitter, receiver and timing circuits. A remote control unit is provided together with either one or two indicators for remote presentation of the distance information. In addition the equipment has facilities for the incorporation of " homing " circuits.

The exhibits of Elliott Brothers (London), Ltd., include an automatic balancing three-channel strain gauge bridge which is unique in combining a sensitivity better than 0·00001 per cent strain with an input stability better than 3×10^{-7} volts. In addition to the presentation of strains on drum dials, the instrument can be provided with continuous chart recording, or with electric typewriter or

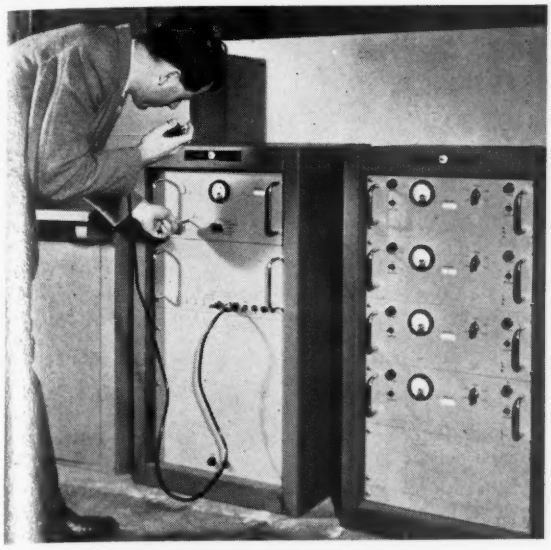


Control unit for Ferranti distance measuring equipment

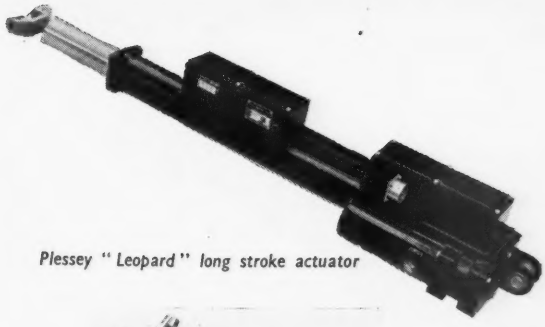
Standard Telephones precision approach airfield radar



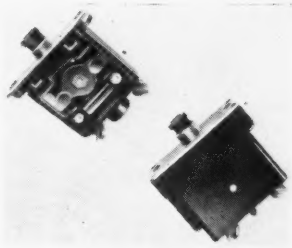
Elliott automatic three-channel strain gauge bridge



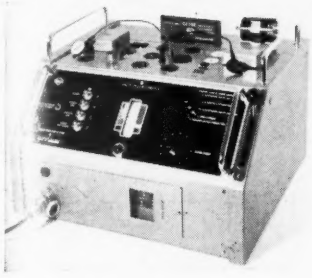
Marconi 50 W v.h.f. transmitter



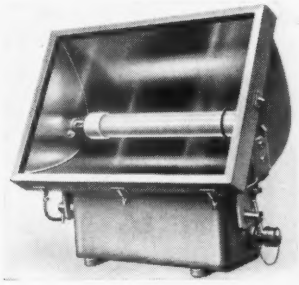
Plessey "Leopard" long stroke actuator



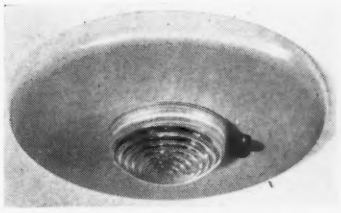
Salford "Klixon" circuit breaker



Mullard high speed valve tester



Revo sodium flare



Venner emergency lighting unit

punched card presentations. Other apparatus includes microwave equipment, digital and analogue computors.

The radio, radar and electronic equipment shown by Marconi's Wireless Telegraph Co., Ltd., includes a 50 W v.h.f. transmitter and its associated receiver, both designed for air traffic control use. A comprehensive flexible control system is demonstrated with this equipment and there is also a v.h.f. direction finder and a v.h.f. omni-directional radio range beacon. Both airborne and ground navigational aids are displayed by E. K. Cole, Ltd., while Pye, Ltd., is showing a number of items of radio equipment and allied instruments.

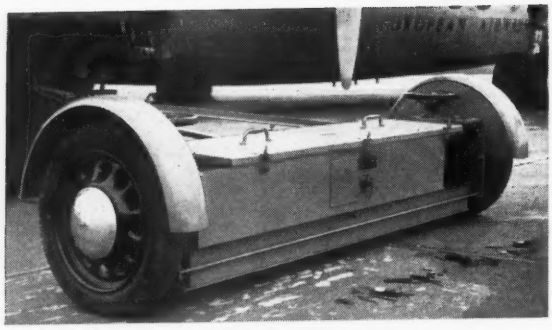
An interesting exhibit shown by Mullard, Ltd., alongside v.h.f. and u.h.f. transmitters and receivers for use under any climatic conditions, is a complete intercom unit using transistors instead of valves thereby saving space, weight and power. There is also a high speed valve tester operating on the control card system which is designed for use by maintenance engineers.

The Plessey Co., Ltd., has a new actuator, known as the "Leopard," which has a stroke of 18½in. It operates with a normal working load of 350 lb and a maximum working load of 900 lb, the operating time being 23 sec with load opposing and 18 sec with load assisting. On the same stand is a windscreen de-icing controller, flasher units, radio equipment, relays, and a precision electronic engine speed indicator.

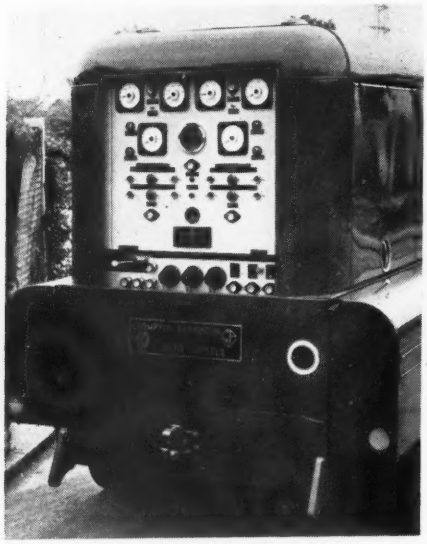
Apart from demonstrating the various versions of its Canberra jet bomber the English Electric Co., Ltd., makers of the P.1 fighter which is capable of supersonic speed in level flight, is showing a wide range of aircraft equipment including rotary and linear actuators, generators, invertors, motors and the "Sundstrand" constant speed drive. The rotary actuator is suitable for applications involving high ambient temperatures such as hot air valve operation, while the linear design can be used as a tailplane incidence actuator and for high load flying controls, etc. The "Sundstrand" constant speed drive is connected to a type 918 alternator designed to supply power at constant frequency.

The British Thomson-Houston Co., Ltd., is exhibiting an extensive range of aircraft components including turbo-starters and high-energy ignition units, booster coils, a.c. and d.c. motors and generators, auxiliary generating plant, switches and contactors, magnetos, an electronic ignition tester, and lighting equipment. A small gas turbine driven alternator is also shown. This is a complete self-contained generating unit designed to provide electrical power in an aircraft independent of the main engines. The only installation requirements apart from space are a supply of fuel and air. The air supply to the engine also ventilates the alternator. The gas turbine is a development of the unit designed by the Rover Motor Company for automobile use.

In addition to a new miniature electro-magnetic transducer, a 1/3 octave spectrometer for vibration and noise analysis, and prototypes of a new range of hermetically sealed instruments, Salford Electrical Instruments, Ltd.,



G.E.C. magnetic sweep for airfield use



Crompton Parkinson-Auto Diesels ground power unit

is introducing its " Klixon " circuit breaker for use in aircraft electrical systems. It is made in ratings of 5 A to 50 A in 5 A steps and weighs less than 2½ oz. Among 200 different micro-switches on the stand of the Burgess Products Co., Ltd., is the new " Switchette " developed in conjunction with Rolls Royce, Ltd., for continuous service in jet engines at temperaturs up to 300 deg C.

Against a background of laboratory and other precision instruments, Sangamo Weston, Ltd., have on view a multi-scale position indicator for synchronizing engine speeds on multi-jet aircraft; an airborne tachometer for measuring rotational speeds to within $\pm\frac{1}{4}$ per cent; position, pressure and temperature transmitters; and an automatic potentiometer for measuring jet pipe temperatures or strain gauge data.

The emergency lighting unit for cabin roof mounting shown by Venner, Ltd., is, in common with the wall mounting type, entirely self-contained. It incorporates a Venner light-weight accumulator which gives one hour's light to the lamp when the unit is subjected to a specified deceleration in any direction of a horizontal plane. Either type can be detached from its mounting for use as a portable lamp.

The equipment displayed by the Revo Electric Co., Ltd., comprises a range of lighting fittings for airfield use, including various types of obstruction lights, floodlights, approach lights, sodium flares, etc. All types of aircraft and airfield lighting apparatus are also shown by

Westinghouse " Westruk " type 960

the General Electric Co., Ltd., together with airborne catering equipment, Pirelli-General cables for aircraft wiring, and a battery operated magnetic sweep for clearing runways of metallic articles liable to puncture aircraft tyres. The magnet is 6ft long and consumes 900 W at 54 V. It is mounted with batteries in a two wheeled truck arranged for towing behind a vehicle.

Mobile ground power units for starting all types of aircraft are shown by Auto Diesels, Ltd., a number of them actually being in operation in conjunction with the flying display. On the exhibition stand is a control panel incorporating the protective features which have been standardized in Crompton Parkinson-Auto Diesels ground power units. Another item is a battery trolley used for starting helicopters and light aircraft.

In addition to germanium crystal diodes and selenium and copper oxide rectifiers, the Westinghouse Brake & Signal Co., Ltd., is showing its No. 960 " Westruk " for aircraft employing 28 V d.c. This supplies a continuous servicing output of 500 A and permits a peak load up to 2,000 A for engine starting. Another unit has in addition to a circuit of these same ratings a second circuit giving a continuous supply of up to 300 A at 112 V with a peak load for engine starting of up to 600 A.

Among the exhibits of British Insulated Callender's Cables, Ltd., are a comprehensive range of aircraft cables, including the " Pren " type for wiring where moderate temperatures are encountered. For special conditions there are " Glasil " cables for use where the temperature is likely to be between -50 deg C and $+150$ deg C, and " Glasef " cables, insulated with p.t.f.e. for operating between -75 deg C and $+250$ deg C. There is also " Nypren " which is resistant to synthetic lubricating oil.

Comprehensive ranges of aircraft batteries of all types are shown by Oldham & Son, Ltd., Chloride Batteries, Ltd., and Peto & Radford, Ltd. Valves for aircraft pneumatic systems are exhibited by the Hymatic Engineering Co., Ltd., while Heenan & Froude, Ltd., is demonstrating aircraft engine testing equipment of all types.

On the stand of Thorn Electrical Industries, Ltd., the new " Plasteck " aircraft console panel and cockpit illumination system is being demonstrated alongside a new range of landing and navigation lighting fittings. A new lightweight system of fluorescent lighting for aircraft, as fitted in the Bristol Britannia, is explained in detail on the stand of Philips Electrical, Ltd.

A wide range of insulating materials is being shown by Bakelite, Ltd. Hellermann, Ltd., is exhibiting its binding system of insulation and identification sleeves of all types. Aircraft cables of all types are being displayed by W. T. Henley's Telegraph Works Co., Ltd., including h.f. cables, connection wires for electronic apparatus, winding wires, flexible cords, etc., and also electric soldering irons.

Public Lighting Engineers

Next Week's Conference and Exhibition of Equipment

BETWEEN 1,100 and 1,200 members and delegates from local authorities and Electricity and Gas Boards throughout the British Isles are expected to attend the annual conference and exhibition of street lighting apparatus and equipment arranged by the Association of Public Lighting Engineers at Eastbourne next week.

The proceedings begin on Tuesday morning at the Winter Garden, Devonshire Park, with the annual general meeting and induction of the president, Mr. L. A. Doxey (street lighting engineer, Leeds). Following an address of welcome, the Mayor of Eastbourne (Councillor L. W. P , J.P.) will then officially open the conference and exhibition in the Pavilion and grounds, adjoining the Winter Garden, and afterwards make a tour of inspection accompanied by the president.

In the afternoon the presidential address will be delivered and this will be followed by the first conference paper by Mr. W. Robinson (E.D.A.) on " Street Lighting and Road Safety." During the evening the delegates will be given a civic reception by the Mayor and Mayoress.

At the annual luncheon on Wednesday the principal guest will be Sir Roger Duncalfe, president of the British Standards Institution. A motor coach tour through the Sussex countryside has been arranged for the afternoon and during the evening there will be a tour of inspection of lighting installations.

Included among the papers to be read on Thursday are " Some Unusual Uses of Fluorescent Lamps in Street Lighting " by Mr. B. C. Ossitt (South Eastern Electricity Board) in the morning, and " The Control of Electric Street Lighting " by Mr. A. J. Ogle, A.M.I.E.E. (North Eastern Electricity Board) in the afternoon. For the ladies the afternoon may be spent on a motor coach tour to Herstmonceux and Battle. In the evening there is a reception by the president and Mrs. Doxey followed by dancing.

On Friday morning the last paper of the conference session is to be presented by Messrs. A. J. Harris and A. W. Christie (Road Research Laboratory) on " Research on Two Aspects of Street Lighting: Accident Statistics and Road Surface Characteristics." The president will then address the meeting and officially close the conference.

PREVIEW OF THE EXHIBITION

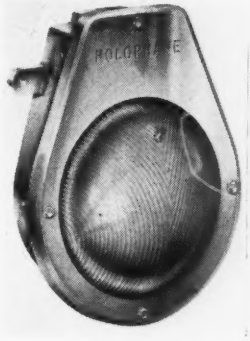
The theme of the Electrical Development Association's display at the exhibition will again be street lighting and road safety. This will be stressed by a dramatic representation of a car driver's view of a pedestrian under conditions of good and bad lighting. There will be charts illustrating the latest road accident statistics, with particular reference to the night-time figures, and the development of the situation since the last conference will be graphically portrayed. Of special interest will be an analysis of the effect of flashing beacons on night-time pedestrian casualties after the first full year's use. Copies of the E.D.A. booklet " A Matter of Light or Death " will be available on the stand.

A house-side lantern and glass prismatic refractors providing alternative light distributions are new developments being introduced by Holophane. The lantern, for Group " B " street lighting, is designed for mounting at a height of 13–15ft on the walls of buildings fronting on to narrow streets. It may also be used in situations where columns would cause obstructions to road users. Pear-shaped in front elevation, it is provided with conduit entries at the top and at the two sides and the whole is supported by a hinge, so that it swings easily to one side for re-lamping and servicing. A new type of prismatic front glass is used to give a non-axial light distribution. The lantern is suitable for lamp wattages from 60 W to 200 W, including the 80 W and 125 W mercury discharge and fluorescent lamps and the 45 W sodium discharge lamp.

Holophane bowl and dome refractors are well established for Group " B " roads and there are already several alternative designs; none of these, however, caters completely for the present-day requirements of street lighting combined with a suitable degree of area lighting. A new bowl and two new dome prismatic glass refractors have therefore been made to fit existing lanterns without alteration, giving a wider spread of light suitable for residential roads with wide grass verges and deep gardens which require lighting as well as the roadway itself.

Also included in the Holophane display are the recently developed fluorescent prismatic glass refractor lanterns for use with type M.B.F. mercury-fluorescent lamps; post-top units for M.B.F., sodium mercury discharge and tungsten filament lamps; a sodium cylindrical lantern; and a range of lanterns and glassware for street lighting, as well as bulkhead units for public buildings.

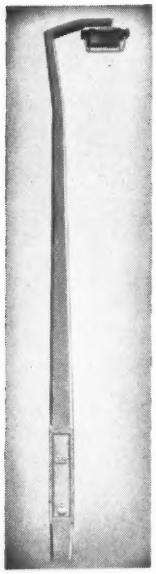
Revo C14106 " Hatfield " lantern



Holophane house-side lantern for Group " B " lighting

The items chosen for display by the Revo Electric Co., Ltd., comprise a range of lighting fittings for use with discharge and filament lamps suitable for both groups " A " and " B " installations. The " C14407/8 " lantern consists of a cast aluminium alloy dome with an inner reflector of vitreous enamelled sheet steel. Pre-set focusing is provided for 60, 100, 150 and 200 W tungsten filament lamps, and 80 and 125 W mercury vapour and fluorescent mercury vapour lamps. The reflector carries the directional lens or symmetric type dome refractor. This series also includes the " C14403/4," an open type lantern with dome refractor and " C14409/10," an enclosed type lantern with bowl refractor. Another fitting, the " C13194," is designed for use in the vicinity of aerodromes, and has screens which limit the upward emission of light in conformity with the recently issued M.O.T. specification; the screens can be partially removed to facilitate cleaning. Other exhibits include the " C14446," a vertical fluorescent unit for wall-mounting, the " C14372 Sol-Etern " lantern designed for group " A " roads and the " Hatfield " lantern recently installed in the new town of Hatfield.

In the outdoor section eight Revo street lighting columns



G.E.C. "Brevis" pre-stressed column and sodium lantern

with brackets and lanterns for both group "A" and "B" installations are on display. The columns include examples in cast iron, tubular steel and concrete with some recently introduced designs passed by the Royal Fine Art Commission.

For trunk road lighting the General Electric Co., Ltd., is exhibiting for the first time its new pre-stressed concrete street lighting columns. Two examples will be shown, the "Altus" and "Brevis," for mounting heights of 25ft and 15ft respectively. They have been approved by the Council of Industrial Design and accepted by the Ministry of Transport for trunk roads. Normally the columns have a ground finish which exposes the aggregate and assists materially in maintaining a clean appearance in industrial atmospheres. Alternatively, natural and acid finishes can be supplied.

Among developments in lantern design represented on the G.E.C. stand will be an improved cold cathode lantern in which the gear chamber is arranged to drop below the body for easier access. The lantern houses five "Osram" 67·5 W cold cathode tubes. Another fluorescent lantern recently introduced is the "Three-Eighty" cut-off design for central suspension along tree-lined roads. It is also suitable for roads and open spaces close to airports where it is necessary to avoid confusion with aircraft landing lights. Other items include a new cut-off lantern for side road lighting and among main road lanterns an "aero-screened" type for 250/400 W mercury lamps.

Recent improvements in the efficiencies and life of "Osram" mercury and sodium lamps, and their effect on maintenance, will be illustrated by graphs and diagrams, and of particular interest to the street lighting engineer will be a similar display dealing with the characteristics of the new "warm white" tube. Demonstrations will be given of the G.E.C. ripple control system for the remote switching of street lighting by means of audio-frequency currents superimposed on the mains.

Several interesting exhibits are shown on the stand of Franco Traffic Signs, Ltd., including the latest of its bollards. Known as the "4E," its design is based on recent recommendations by the Ministry of Transport. It is constructed entirely of steel and the complete chassis and cap are specially treated with a rust resisting coating before enamelling. The watertight inspection door is at the rear so that maintenance can be carried out in safety. Also to be seen is the latest Franco external lighting fitting, the "Exlite" type III, and signs for London's "through routing" scheme. Incidentally, those interested in seaside illuminations can see the "Franco Fairy Folk" ranging from 2 to 4ft in height.

In view of the development of fluorescent street lighting the model "Q" time switch exhibited by the Horstmann Gear Co., Ltd., is of particular interest. It is arranged to control two circuits so that by its use full lighting may be switched on at dusk, reduced to half lighting about midnight and finally switched off at dawn. In addition to the hand wound types previously offered, this model has recently been made available with a synchronous motor driven movement without spring reserve and also with an electrically wound movement with spring reserve.

Still popular with lighting authorities who desire a small compact unit, the electrically wound type "Y" switch can be readily fitted into the modern streamlined type of lamp column where space is necessarily limited, and being of the plug-in type, the switch and clock movement may be removed without disturbing the wiring. Among other products which may be seen will be the Horstmann flasher unit for "Zebra" crossing beacons.

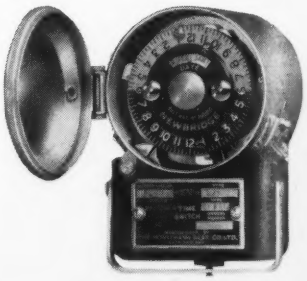
The Venner exhibit shows how well its time switches withstand extremes of cold, heat and vibration to a degree most unlikely to be met in actual use. One synchronous motor driven, solar dial, type MSSP switch is shown operating under water. A large selection from the Venner range of switches to meet the varied time control requirements of public lighting installations are on display including type MSDC, designed for up-to-date fluorescent lighting. In addition to time switches, a Venner "Park-O-Meter," the modern method of car parking control, will be demonstrated.

Sangamo Weston, Ltd., will display its range of Sangamo type SS synchronous time switches. Many types are available, the most popular for street lighting control being the type SSC and its variants. Examples of Sangamo watt-hour meters will also be on show and these include the single-phase and the two and three element polyphase patterns. In addition, there will be a representative range of Weston electrical measuring instruments. These cover all requirements from laboratory standards to miniature panel instruments and also include photo-electric exposure meters.

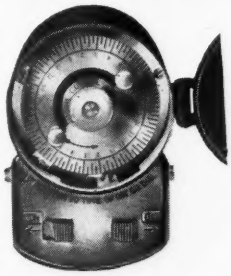
The range of "Gunfire" time switches and controllers produced by the British, Foreign and Colonial Automatic Light Controlling Co., Ltd., is being shown and includes the electrically wound model, type "EW/10." Should the mains supply fail this switch has four days' spring reserve.

Two new lanterns for Group "B" roads now in production by Falk, Stadelmann & Co., Ltd., are being shown for the first time. One lantern, the "Wellesley," can be used with 100/200 W tungsten or 80/125 W MA/V or MBF/V h.p.m.v. lamps. The hood is of die-cast aluminium alloy treated by the "Alocrom" process for high resistance to corrosion, primed and stove enamelled grey. Light control is obtained by a glass dome refractor and a clear outer enclosing bowl is used for ease of cleaning. Two stainless steel spring clips provide a firm and even pressure on a rubber gasket between bowl ring and hood to exclude water and dust. A clear "Perspex" bowl is available as an alternative. The second new lantern, the

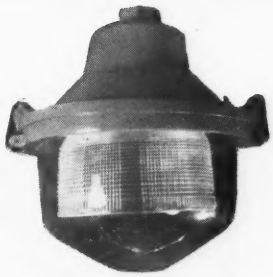
Horstmann type "Q" time switch



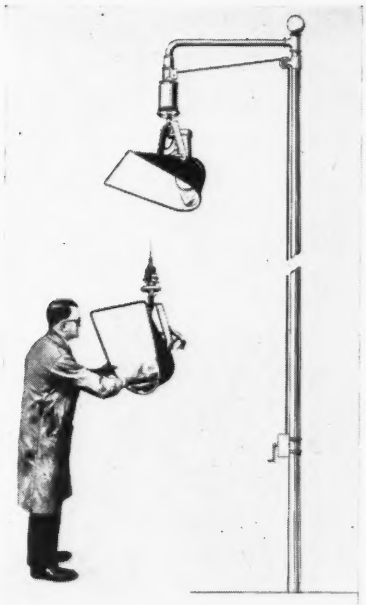
Franco "Exlite" type III external lighting fitting



" Gunfire " time switch



Falk's "Wellesley" lantern



Benjamin " Duoflux " with special bracket designed for use with raising and lowering gear

" D gonfly," corresponds in construction to the " Wellesley " but prismatic bowl refractor, substantially smooth on the outs e, replaces the dome refractor and clear outer bowl.

In addition to the lanterns for traffic routes one or two exa les of other forms of fittings for public lighting such as fl dlights, bulkhead and well-glass fittings, decorative outd r lighting fittings, etc., are shown.

A lable for examination on the stand of the Engineering & Li ting Equipment Co., Ltd., are fittings for Class " A " and lass " B " lighting using sodium, mercury discharge and ngsten filament lamps. The " Golden Ray " Mk. III lante for both 45/60 W and 85/140 W sodium lamps is avail le either for normal installation where control gear is ho sed in columns or boxes or with accommodation for the g r in the hood of the fittings. The " Lancaster " and " Tr g " lanterns for use with 250/400 W mercury lamps can a o be seen, in addition to three new lanterns based on the w ll-known " Ware," " Baldock " and " Letchworth " fitting

Tw lanterns of pleasing appearance for either steel or concre e lighting columns are being displayed by Aeroplastics, Ltd. The " Carrick " is for Group " A " road lighting and has been accepted by the Ministry of Transport for use on trunk roads. This lantern was primarily designed for use with a 100 W sodium lamp but it is also suitable for use with an 85 W sodium lamp. The " Kyle " is a similar lantern and is for Group " B " road lighting. It is suitable for use with either 60 or 45 W sodium lamps.

The new B.T.H. 25ft street lighting column

The stand of the British Thomson-Houston Co., Ltd. will be dominated by the new B.T.H. 25ft concrete street lighting column on show for the first time. Entirely new in design, the column has been developed for use with the new range of " Mazda " street lighting lanterns, and will be shown fitted with the " Amber " sodium refractor lantern for Group " A " roads.

" Mazda " incandescent and discharge lamps suitable for street lighting will be available for inspection and improvements will be illustrated graphically. In the case of the type MA mercury discharge lamp a skilled glass worker from the B.T.H. Leicester Lamp Works will demonstrate the hand fabrication of mercury arc tubes. Other lamps shown will include the new " Mazda " sodium vapour lamps made from a special hard glass and the " new warm white " fluorescent lamp.

The Gowshall display includes a variety of illuminated guardposts among which is type G50 " Sheerline." Other items displayed include the " Signlite " external lighting unit, centre island and lighting columns, cast iron island refuge sections, " flashing beacon " assemblies and auxiliary equipment connected with road sign installations.

A typical selection from its range of outdoor floodlights, together with some street lighting reflectors, is displayed by Benjamin Electric, Ltd. Several recently introduced floodlights are included and these, together with others in the range, enable the company to satisfy practically any type of floodlighting installation. Re-designed " Rodalux " and " Ruralux " reflectors for the economical lighting of secondary roads, approaches, sidings, etc., are being demonstrated for the first time, and one of the new developments is the interchangeable grip flange, which is also used on the Benjamin hoarding reflector. Another interesting exhibit on the Benjamin stand is the modified design of the " Duoflux " floodlight for use with raising and lowering gear in order to facilitate cleaning and servicing, which can now be done at ground level.

The " Rythmatic " ripple control system for the centralized remote switching of street lamps is the principal exhibit of the Automatic Telephone & Electric Co., Ltd. The type 46 control switch can be accommodated in almost any type of existing time switch housing. The company is also exhibiting its " Electro-matic " road signal system for the control of vehicles and pedestrians.

In order to show the advantages of fluorescent lighting for the theatre, outdoor floodlighting and for the lighting of public buildings, the principal feature on the " Atlas " Lighting Division stand will be a miniature theatre built to demonstrate the operation of dimmer-controlled fluorescent lighting equipment. A further exhibit of Thorn Electrical Industries, Ltd., will introduce the new " Atlas " low temperature tube which is specially designed for street lighting and will strike in temperatures as low as 10 deg C. There will also be some illuminated colour photographs of the new Rye House power station.

Five Group " A " and three Group " B " spun concrete lighting columns all of which have been approved by the Council of Industrial Design or passed by the Royal Fine Art Commission are on view at the Stanton outdoor site. The Stanton display stand includes photographs and coloured transparencies of column installations together with sections of actual columns.

Concrete Utilities " Avenue 3DNN " column

Eight " Adastra " lighting columns are displayed by Poles, Ltd., and these include three new designs exhibited for the first time. The " Adastra " universal column for 25ft mounting height is of sectional steel galvanized construction and of pleasing tapering form. The diameter at ground level is 7½in so that it is most suitable for use with lanterns housing their own auxiliary gear. A flush fitting door gives access to the interior of the column. The " Alpha " Class " B " column in one piece construction will support a variety of brackets or post top lanterns and the " Beta " Class " B " column is of the same construction but outlines a double taper providing a reduced diameter at ground level and therefore reduced obstruction on the footpath. A floodlight tower exhibited is one of a standard series designed to carry three large floodlights at heights up to 60ft.

Concrete Utilities, Ltd., are exhibiting in the outdoor display a selection of group " A " and " B " concrete lighting columns of standard design. The one illustrated, the " Avenue 3DNN " column, is particularly slim and has a newly designed " Arc III " bracket, which is available in standard outreaches; it has been approved by the Council of Industrial Design.

A selection of standard tubular steel street lighting columns including six columns suitable for Group " A " roads (25ft mounting height) and two columns suitable for Group " B " roads (15ft mounting height) is shown by Stewarts & Lloyds, Ltd. Ornamentation in the form of scrollwork, collars, bases, etc., is excluded, though such embellishments can be supplied if required.

A 40ft high tubular steel tower carrying up to six floodlights, designed for the illumination of football grounds, sports arenas, etc., is shown by Tubewrights, Ltd.

Erecon, Ltd., public lighting contractors, are exhibiting on their outside site concrete columns for both Class " A " and " B " roads, and a single Class " A " steel column.

Tower wagons shown by the Ford Motor Co., Ltd., will include three and four stage models, the mechanism consisting of a revolving platform which turns through 360 deg and has eight locking positions. The two models of the " Bedford-Eagle " three stage tower wagons, available from Vauxhall Motors, Ltd., have a fully extended height of 25ft, and the tower can be locked in any position. The " Eclipse " portable telescopic tower ladder (R. A. Lister & Co., Ltd.) is mounted on an " Auto-Truck " and is extended by means of a power operated hydraulic pump to a maximum height from ground to platform of 24ft 6in.

North Wales Water Power

AS already briefly reported, the British Electricity Authority is seeking the consent of the Minister of Fuel and Power to promote a Bill in the forthcoming parliamentary session for the development of the Festiniog pumped storage scheme and the Rheidol hydro-electric scheme in North Wales. If these schemes are authorized, they will together provide some 349,000 kW of additional generating capacity in the area.

It will be recalled that the proposals put forward in 1952 for hydro-electric development in these areas were deferred owing to restrictions on capital expenditure. Since that time, further investigation has been made of the possibilities and the Authority considers that the revised schemes now proposed are a marked improvement on the earlier ones in regard to their effects on local amenities. For instance, the original Rheidol proposals provided for the diversion of the head waters of the Rivers Severn and Wye into the Rheidol catchment area, and those of Rheidol into the Dovey estuary. None of these features, which provoked opposition in some quarters, is included in the scheme now proposed.

The legislation proposed would be on similar lines to that embodied in the North Wales Hydro-Electric Power Act, 1952, in respect of the preservation of amenities, and regard would be paid to riparian interests by providing for the discharge of reasonable quantities of water below each of the points of extraction in both schemes.

Festiniog Scheme

In a pumped storage scheme, electricity generated in steam power stations is used outside the hours of peak electricity demand to pump water from a low level reservoir to one at a higher level. Power is generated by the pumped storage plant during peak hours by allowing the water to flow from the upper to the lower reservoir through turbine-generators. Although a considerable number of such schemes are operated successfully in other countries, chiefly in Europe, this would be the first of any considerable size to be constructed in Great Britain. The proposed works would be situated near the village of Blaenau Festiniog and close to the mining district, where there should be no interference with the natural beauty of the area.

The scheme would utilize the existing Llyn Stwlan as an upper reservoir, the storage capacity of which would be increased by a concrete dam 90ft high and about 900ft long. The lower reservoir would be formed by another concrete dam 35ft high and about 1,800ft long immediately up-stream of the village of Tan-y-Grisiau in the valley of the Afon Ystradau. Between the two reservoirs, which will probably be connected partly by a tunnel and partly by surface pipe lines, there would be a head of approximately 1,000ft.

The power station, which would be situated on the edge of the lower reservoir, would contain six combined generating and pumping sets, each consisting of a water turbine, centrifugal pump and generator/motor, together with ancillary plant. It is envisaged that the annual output from the Festiniog scheme, estimated at some 300 million kWh, would be fed into a section of the 275 kV supergrid through a new switching station which would be constructed adjacent to the pump storage station.

Rheidol Scheme

The Rheidol hydro-electric scheme is situated about ten miles due east of Aberystwyth in Cardiganshire. The available head of water would be utilized in two main stages providing a total generating capacity of 49,000 kW.

In the upper stage, a reservoir would be formed by means of a dam about 150ft across the Afon Rheidol near Nant-y-Moch. The reservoir would be connected by means of a tunnel and a short surface pipe line to a power station situated some two miles down-stream of the dam and discharging into the same river.

The lower stage would comprise a small balancing reservoir formed by a dam across the Rheidol just below the upper power station and connected by a tunnel three miles long to a second power station discharging into the Rheidol a short distance below the Rheidol falls. The water would be returned into the lower reaches of the river and, in order to avoid disturbance of the river regime by the intermittent discharges, a regulating pond would be formed by a small dam, creating a head of which advantage would be taken to generate an additional 1,000 kW.

Part of the 83 million kWh per annum output from the Rheidol scheme would be fed into the grid system by means of a new 132 kV transmission line between Rheidol and Oswestry. The remainder would be used to supply local loads, this proportion increasing with the growth of demand in the area.

Developments in Science

The Oxford Meeting of the British Association

AT the inaugural meeting of the British Association for the Advancement of Science on 1st September Dr. E. D. Adrian delivered the 116th presidential address, the subject of which was science and human nature. The scientific age in England was conceived, he said, 300 years ago with discussions by a group of men who were interested in new kinds of knowledge based upon observation which could be confirmed by experiment instead of by appeal to authority. The British Association was founded in 1831 to bring scientists and laymen together in spreading information about scientific advances. To-day, with increasing specialization, the Association also presented an opportunity to scientists to learn what was happening in fields outside their own.

After discussing the dangers due to scientific progress (e.g., the atomic bomb, authoritarian systems of education and new drugs) Dr. Adrian submitted that an increased knowledge of reactions of the human mind could be used to forestall disastrous influences. The science of economics, which dealt with millions of individuals, was based on figures which checked its theories. With similar modern techniques for fact finding, psychologists had far more knowledge of the irrational factors which could sway smaller groups as well as the family and the individual, though with less precision than economists. Any new branch of study which tried to substitute methods of natural science for unchecked speculation was to be welcomed.

Human beings possessed unique equipment for thinking and communicating ideas and of making records which far transcended the storage capacity of a single brain. The increasing background of experience had resulted in the acquisition of new habits and new ways of thought, by which brains had been modified, chemically and physically. The number of university students was rising rapidly all over the world with the effect of training the most intelligent to deal with their environment by learning from the past. This could have happened only through scientific inventions.

Developments in Nuclear Physics

The presidential address to the Physics and Mathematics Section was delivered by Sir John Cockcroft on the following day. Its theme was recent developments in nuclear physics, prefaced by an account of the pioneer work of Rutherford and others in this field. Especial attention was paid to the properties and influences of, and experiments with, the several types of mesons which materialized in very close violent collisions and transmitted the forces. Atomic nuclei were bound together by a nucleon-meson field, just as atoms and molecules were by electric and magnetic fields. A linear accelerator for producing 600 MeV protons was being built at Harwell; these protons would bombard a liquid hydrogen target and provide 1,000 times as many mesons as were now available.

Economical nuclear power depended upon three main factors. First, the reactor must burn a sufficiently high proportion of its uranium fuel to achieve low fuel costs, leaving as many neutrons as possible for producing new fuel from otherwise inert materials, such as U238 and thorium. Nuclear technology was the second important factor; uranium fuel must be prepared cheaply and have metallurgical properties favourable to long life for the reactor; spent fuels must be chemically processed and any valuable secondary fuels, such as plutonium, returned for reburning. The third factor was good engineering design, leading to reliable and safe operation and low capital costs.

The first large-scale power station being built in Cumberland to use nuclear energy as a source of heat should lead the way to improved designs which should produce power a little above conventional costs and make an effective contribution towards electricity supply within twenty years. Other, perhaps more efficient, nuclear power units also presented attractive possibilities and would repay investigation. The application of nuclear fission, wisely guided, could ensure all the energy needed for ever growing demands.

New Materials in Engineering

The effect of new materials on engineering progress formed the subject of the presidential address to the Engineering Section. Most of the examples shown by Dr. Willis Jackson related to electrical engineering. Dealing first with power cables, he traced the development of insulation from gutta-percha, as already used for submarine cables, vulcanized rubber and vulcanized bitumen for 100 V d.c., to the present time. He referred to the designing and laying by Ferranti in 1885 of six miles of a.c. cables from Deptford to Grosvenor Gallery in London, which consisted of two concentric copper tubes separated by lapped paper impregnated with ozokerite wax and requiring joints every 20ft; these operated satisfactorily for more than forty years.

When the first world war ended the highest voltage for underground transmission was raised from 22 kV to 33 kV after many failures and subsequently to 66, 132 and 275 kV. The insulation was still impregnated paper, but steady improvements were made in the choice of its constituents and methods of processing, in impregnating mineral oils (which replaced wax in 1912), and in techniques such as the application of pressures up to 200 lb/sq in to the impregnated oil so as to prevent ionizable voids within the insulation — the primary cause of breakdown. In consequence, the permissible operating temperature had been doubled, the electric stress increased more than eight-fold and the power loss factor very considerably reduced.

In 1933 the discovery of polythene, during researches by Imperial Chemical Industries into the behaviour of gases under pressure of 1,000 atmospheres, produced a greatly superior substitute for gutta-percha for submarine cables that had the right physical properties and low electrical losses up to very high frequencies. Polythene was used for the insulation of submarine cables incorporating submerged repeaters (a post-war development) which were incorporated in under-water telephone systems at 40 to 50 mile intervals to provide periodic amplification of signals.

Transformers were now in operation up to 190 MVA and 350 kV with full-load efficiencies of 99·4 per cent. Magnetic losses in the core had been reduced by several hundred per cent after 1900 by the addition of a small percentage of silicon to low-carbon steel, which also

eliminated magnetic ageing formerly due to the heat engendered by these losses. Further progress during the last ten to fifteen years, notably by the almost complete elimination from the steel of impurities and by high temperature annealing in hydrogen, had reduced the power loss in British transformers by about 30 per cent.

During this period research on the cubic single crystals of ferromagnetic materials had revealed that these were highly directional in their magnetic properties and that silicon-iron sheet could be produced closely approaching single crystal structure and magnetic orientation. This had been done by following the hot-rolling process with a sequence of cold-rolling and annealing. The result was a substantial improvement.

A different way of progress was by the discovery and recognition of the potentialities of some special property of a material leading to a new engineering technique. A post-war example was the germanium crystal triode (transistor), the construction of which was described. This was an amplifying device capable of performing most functions of the thermionic triode valve, but simpler and smaller and not requiring a heated cathode as its source of electric charge carriers; it was also able to withstand high resistance directional operation.

Nuclear Energy

A second illustration was furnished by the conversion of the nuclear energy of uranium into electrical energy. The isotope U235 could be split by the entry into it of an uncharged neutron, the disintegration making available other neutrons to continue the process. The aggregate mass of fission products was less than that of the original U235 atom and this mass difference appeared as free kinetic energy.

In the atomic bomb all the fission neutrons ideally produce further fission in a chain reaction. In a power reactor, however, the fission rate must not be cumulative but be kept substantially constant. The reactor would continue in operation so long as one of the neutrons ejected per fission produced further fission.

Natural uranium contained only 0·7 per cent of fissionable U235, the remainder being U238. Some of the ejected neutrons would be absorbed by U238 atoms, producing plutonium, while others would be absorbed unprofitably in the reactive structure. The statistical probability of the fission capture of neutrons by U235 was greatest when these were of low energy, to which the fission neutrons had to be slowed down. To do this the uranium fuel was arranged as an array of parallel rods surrounded by a moderator, with the atoms of which the neutrons successively collided, losing energy before being diffused back into the fuel elements at energies at which the probability of capture by the scarce U235 was high. As the moderator should function with a minimum number of collisions and a minimum loss of neutrons, it should be of low atomic weight and low neutron absorbtion characteristics. The present choice was between highly purified graphite, light water (H_2O) and heavy water (D_2O), deuterium being the heavy form of hydrogen. Heavy water was better in both respects than graphite, but did not provide similar support for the fuel elements and was much more expensive, costing about £25,000 per ton. Light water slowed down neutrons more effectively, but had a much greater neutron absorbtion, entailing the use of costly enriched uranium (i.e., a higher proportion of U235 than natural uranium).

Energy released by fission amounted to the equivalent of 22,000 kWh per gram of U235 and the heat was removed by one of five cooling media—helium, carbon dioxide, light water, heavy water and sodium or sodium-potassium alloys. The reactor for the power station in Cumberland would use graphite as moderator and carbon dioxide at several atmospheres pressure as coolant. Extensive use of liquid sodium or its alloys lay many years ahead but permitted a much higher temperature and therefore an improved thermal cycle in the power unit.

The most important materials problem in reactor design related to the casing of the fuel elements. This must be fabricated in thin walled tubes; capable of withstanding very heavy thermal and mechanical stresses at elevated temperatures; possessed of mechanical properties that did not deteriorate under intense neutron bombardment; free from corrosion. It must also exhibit low neutron absorption which limited the choice to such metals as aluminium, magnesium, beryllium and zirconium. Aluminium and magnesium had melting points that were too low and inadequate mechanical properties for future power reactors.

Increasing Use of Semi-Conductors

In a paper on semi-conductors, transistors and photo-cells (Mathematics and Physics Section, 2nd September) Dr. R. A. Smith attributed the rising importance of semi-conductors to the information they gave about the conduction of electricity in solids and the binding together of atoms to form solids, and also to their practical uses. These were at present mainly as low-power rectifiers for microwave receivers in radar, as the sensitive element in infra-red photo-conductive detectors, and now as the solid electronic valves known as transistors which might replace a substantial fraction of the vast number of vacuum tubes in use.

In semi-conductors current might be carried in two distinct ways, by electrons and by "positive holes," both of which were relatively free to move through the solid and the numbers of which were to some extent controllable, giving them their practical importance.

The number of carriers might be increased by illumination and semi-conductors were peculiar in that infra-red radiation and photo-electric detection and recording techniques were made available for a large region of the infra-red spectrum as well as for visible light.

The number of carriers in a semi-conductor might also be changed by "injection" of new carriers at a point contact. In the point-contact transistor the current through one such contact was modulated by carriers injected through a nearby contact to give power amplification, using the device like a triode valve.

Many limitations of the point contact transistor had been overcome by p–n junctions, i.e., the junction between a semi-conductor in which the current was carried largely by electrons with one in which it was carried largely by "positive holes." With silicon as a junction material, these might ultimately replace most of the low-power rectifiers now in use. The p–n junction might also be used to make more robust and reliable transistors, which for many (but not all) purposes might replace point contact resistors. The p–n junction might also be used as a photo-electric generator to turn light energy into electrical energy for driving a wireless set incorporating transistors.

A new discovery was the inverse of carrier injection—namely carrier extraction, by which a large number of carriers in a semi-conductor might be swept out by the application of an electric field. That phenomenon might lead to important new technical developments, including the use of germanium transistors at considerably higher temperatures than at present.

Among papers on low temperatures before the same Section on 3rd September was one by Dr. A. H. Cooke on magnetism at low temperatures, in which he discussed recent experiments on the properties of magnetic materials

at very low temperatures and their applications in research and the magnetic method of attaining such temperatures.

Dr. N. Kurti followed with a paper on the low temperature aspects of nuclear orientation, describing methods which had been or could be used for orientating atomic nuclei in solids. Under favourable conditions and at very low temperatures, he said, preferential orientations could be established with respect either to an external magnetic field or to a crystal axis. To carry out a nuclear demagnetization experiment, he said, the nuclear paramagnetic substance (say a metal whose nuclei possessed magnetic moments) had first to be magnetized in a field of between 50 and 100 kilogauss at one-hundredth of a degree, but no successful nuclear magnetic cooling had yet been carried out. At 0·01 deg K and in 100 kilogauss the nuclei would be directed preferentially along the magnetic field. Such orientated nuclear systems could be of great use to nuclear physics.

To produce orientated nuclei for radioactive experiments some experimentally simpler methods were available. Instead of an external magnetic field of 100,000 gauss, one could use the strong magnetic fields (of the order of half a million gauss) produced by the electron spin at the point of the nucleus in paramagnetic ions, when the nuclear spin set itself parallel to that local magnetic field if the temperature were a few hundredths of a degree absolute. If orientation of these electron spins were parallel throughout the specimen it would result in a high degree of nuclear orientation. The ordering of the electron spins was brought about either by the action of the electric field of the crystal lattice or by a relatively modest external magnetic field of the order of 1 kilogauss.

The former method was used in the first conclusive demonstration of nuclear orientation carried out by Daniels, Grace and F. N. H. Robinson in September, 1951, at the Clarendon Laboratory in Oxford. The anisotropy of the gamma rays emitted by radioactive cobalt 60 which was incorporated in a paramagnetic crystal and cooled to one hundredth of a degree was shown clearly. In one later Oxford experiment a degree of orientation of nuclei of more than 90 per cent was attained.

Although at present most experimental results are of main interest to nuclear physicists, the situation would change when nuclear magnetic cooling experiments got under way and, possibly, temperatures of 10^{-5} or 10^{-6} deg were reached, at which "nuclear ferro-magnetism" might be observable.

Industrial Boiler Efficiency

On Thursday morning, in the Engineering Section, Mr. D. C. Gunn (British Coal Utilization Research Association) discussed operational problems influencing the efficiency of industrial boilers. The present deficiency of coal, if unchecked, might well reach 20 million tons annually by 1965. The demand should be reduced not by limiting the services provided, but by ensuring that coal was burned with the greatest practicable efficiency.

Of the 100 million tons of coal used annually for steam raising, 60 million were used on shell type boilers, with an estimated thermal efficiency of 60 per cent. By increasing their efficiency to the reasonably attainable maximum of 75–80 per cent, 10 million tons per annum could be saved.

The chief sources of inefficiency were the quantity of unburned carbon which escaped with the ash and grit, and the amount of heat which passed up the chimney with the discharged products of combustion. Carbon losses, which with ill-regulated plant could amount to 10 per cent of gross heat input, could be less than 2 per cent with modern firing appliances.

The components of the chimney loss, apart from the irreducible heat in the water vapour resulting from the combustion of hydrogen in the coal, were the heat potential in combustible gases and smoke particles, and the sensible heat of the products of combustion. Emission of black smoke might well correspond to a loss of 10–12 per cent of the heat potential in the coal, but correct design of firing equipment, coupled with admission of the necessary secondary air, should reduce that loss to negligible proportions.

Sensible heat losses in the chimney might reach 20 per cent, depending firstly upon the quantity of gas flowing, or the amount of excess air with which the fuel was burned. The second variable was the exit temperature of the gases, also due to excess air, but depending on the heat transfer per unit of boiler heating surface. Boilers of large heating surface area in relation to the desired load extracted more heat from the combustion products, giving a lower exit temperature and higher efficiency.

A simple relationship between boiler efficiency, excess air and rate of heat transfer per sq ft of heating surface, which had been derived from statistical analysis of boiler test data, suggested that operational factors were far more important in determining boiler efficiency than were the finer points of design.

Control of air supply in relation to the quantity of coal burned could best be done automatically. An automatic system often used the measurement of steam flow from the boiler, the signal then being amplified to operate the dampers controlling the air flow. That air flow, in turn, could be measured and used to control the fuel flow. Such systems cost little more than instrumentation involving indicators and recorders.

Improvements in efficiency of about 3 per cent, meaning a saving of about 4 per cent in coal consumption, had been obtained. Finally the author emphasized the need for a high standard of training for the employees responsible.

Draining Methane in Collieries

Dr. J. H. Jones and Mr. J. G. Bromilow (National Coal Board), in a paper on the drainage and utilization of firedamp from collieries, discussed work in hand to drain methane from collieries in this country and abroad. During excavations in coal-bearing strata, firedamp emitted into the workings might reach 4,000 cu ft of gas per ton of coal mined.

At the Haig pit at Whitehaven, 10 tons of air had to be circulated through the workings for every ton of coal mined. In 1948 about 4 million cu ft or 78 tons per day was discharged from the pit, equal in heat value to 150 tons of coal or 20,000 gallons of petrol. Owing to firedamp drainage output of coal had been increased by 50 per cent and, with only a slight increase of ventilation air, the quantity of methane in the main airways had been decreased by 50 per cent. The burning of that methane in the colliery boilers had released nearly 300 tons a week of washed coal for sale, in addition to supplying the gas demands of Whitehaven after processing by the Northern Gas Board.

Methane for diesels and petrol engines presents no major problems, and its use for gas turbines is being studied. Another application is for general industrial and domestic use, after catalytic "reforming" or admixture with low calorific value gas.

The authors discussed schemes in hand on proposed collieries in this country, one of which includes dual-fuel diesel engines to supply the colliery load and a reforming plant and gas producers to operate in conjunction with public gas supply.

The total amount of pure methane at present drained in Britain was 4·5 million cu ft per day, but so far only half

that quantity was being piped to the surface and used. The ultimate quantity is estimated at 50 million cu ft per day.

During the discussion the thermal equivalent of the methane that could be drained from British collieries was said to be about 8 million tons of coal per annum.

Following Dr. Willis Jackson's presidential address to the Engineering Section on Friday morning there were three papers by young engineers. In the first paper Mr. J. R. Simonson commented an compression-ignition internal-combustion engines designed to burn gas and fuel oil simultaneously, which had been developed within the last 20 years.

Their most important application in this country had been in the generation of power at sewage plants. Sludge gas potential in Great Britain was estimated as equivalent to 500,000 tons of coal per annum.

Lyn had shown that a normally unacceptable fuel could be burned in a diesel engine in conjunction with a spray of another fuel into the inlet manifold. Bunker fuel had been used in a small high-speed engine, as opposed to a large marine engine. The fuel formed the main injection and steady running was possible with a paraffin spray introduced with the inlet air. That combination of fuels resulted in a rather lower thermal efficiency at high loads compared with pool gas oil in place of the bunker oil, but gave an improved thermal efficiency at medium loads.

The very poor part-load efficiency of dual-fuel engines burning natural gas was due to much of the gaseous fuel/air mixture passing through the engine unburned, but thermal efficiencies higher than for diesel operation had been obtained at full load.

Transistors

Mr. G. King, in a paper on transistors, estimated that £30 million had been spent on them in the U.S.A. since their introduction in 1948 compared with £5 million in Europe. That scarcely any profit had been made in selling the devices, perhaps £50,000 in total, indicated a great belief in their future.

The author described the transistor as, roughly, a device which could be a point contact or a junction type, using a tiny piece of germanium in which the flow of current was controlled in such a way that the device amplified it.

The new science of semi-conductor engineering rested on contributions from inorganic chemistry, radioactive isotope science from atomic energy, metallurgy, crystallography, atomic physics, thermodynamics and many others. The transistor had no filament or heater and did not need the input of much more energy than it had to handle, whereas the power fed to the ordinary valve in a radio set was largely wasted as heat—in some cases more than a million times the power that the valve had to amplify.

In the third paper by young engineers Mr. D. W. Harvey discussed the transductor, in which saturable cores controlled the average value of an alternating supply current. It was usually connected in series with the load, control being effected by a direct current signal which determined the point on the alternating current cycle at which the cores became saturated. The impedance of the transductor then became very low, so that nearly all the supply voltage was transferred to the load. By varying the value of the signal current the point of saturation, and hence the mean value of the load current per half cycle, was altered.

In servo work the block diagram technique of synthesis was widely employed, and the transfer function of design components had to be known. For a transductor it was necessary to know the relationship between the load current output and the input signal, which was the control voltage. Since that relationship depended on the nature of the load, the transfer function for each load condition was examined separately.

The transfer functions were established in terms of circuit parameters, so that when the results were applied to servo synthesis, the responses might be predicted without tests.

In servo design it was of advantage to be able to predict the response of magnetic amplifiers for different types of loads. For resistive loads, the response, which was independent of the load, was almost completely determined by the time constant of the control circuit. For inductive-resistive loads, the response was that of a second-order equation, of which the natural frequency was determined by the time constants of the control and load circuits. For all loads the ratio of gain to time constant was improved by a factor of two to three by the addition of a smoothing capacitor across the output of the load rectifier with a minimum value of about $\frac{1}{8fR_L}$, but slightly larger values might be preferable.

Submarine Cable Laying

IN the development of the North of Scotland Hydro-Electric Board's scheme for electricity distribution in the Outer Hebrides, a submarine cable has been necessary for transmitting energy from the new diesel power station on South Uist, now under construction at Daliburgh, to the island of Eriskay. This submarine link consists of Henley 0·06 sq in 22 kV screened three-core p.l.s.w.a. cable made in a continuous length of 2,900 yd. The cable was laid by W. T. Henley's Telegraph Works Co., Ltd., last June. The presence of rock made it necessary to select the devious route indicated in the chart.

The s.s. *Invercloy*, a type of vessel known locally as a "Puffer," was used for the cable-laying operations. Being flat-bottomed, this type of craft can easily be beached for landing the shore ends of the cable. The vessel was fitted with paying-out and braking gear for cable-laying operations. The cable was delivered to the docks by road on a drum of 12ft 4in diameter over the flanges and 7ft 11in wide, weighing 4½ tons. The gross weight of the loaded drum was 38½ tons. At the quayside, the cable was coiled into the hold of the s.s. *Invercloy*.

Before laying operations began a final check on the cable route was made, the responsible officers proceeding over the route at low tide, taking soundings and marking with buoys those rocks which would not be visible at high tide. Laying operations began from Eriskay; the end was landed and run to the overhead line terminal pole. Paying out at a speed of about 2 knots, cable laying proceeded quite smoothly and was completed in about an hour. Operations were timed so that the s.s. *Invercloy* arrived at South Uist at high water where she was beached awaiting low water, when the cable bight was taken ashore and laid up to the terminal pole position. Messrs. Merz & McLellan were the consultants.

Institute of Metals

For the benefit of members of the Institute of Metals who were unable to take part in its autumn meeting in Switzerland, a special general meeting will be held on 25th and 26th November at 4, Grosvenor Gardens, London, S.W.1, for the discussion of scientific papers on "The Constitution of Titanium Alloys," "Preferred Orientation" and "Corrosion and Staining of Aluminium Alloys."

Scottish Industries Exhibition

A Wide Range of Electrical Equipment on Show

OVER 300 firms are participating in the second Scottish Industries Exhibition which opened at Kelvin Hall, Glasgow, last week and continues until 18th September. Practically all branches of the electrical industry are represented, covering the manufacture of generators, motors, switchgear, transformers, instruments, domestic apparatus, cables, installation materials, etc.

The main exhibits being displayed by the Metropolitan-Vickers Electrical Co., Ltd., are an air cooler for closed circuit ventilation on large a.c. generators, an oil cooler for steam turbine lubricating systems, an oil cooler tube nest, vertically isolated switchgear, type VH, a coil-winding machine for bi-metal strip used in Sunvic control equipment, a variety of instruments, motors, relays, etc., and a Newton Victor mobile diagnostic X-ray generator, type 100/90.

A full range of induction type motors (from $\frac{1}{6}$ h.p. to 1 h.p. single-phase and up to $\frac{3}{4}$ h.p. 3-phase), is being shown by Hoover (Electric Motors), Ltd.

Babcock & Wilcox, Ltd., have on show a large type "E" coal pulverizing mill fitted with "Perspex" windows and driven at low speed so that the action of the mill can be observed. Other exhibits include models of a cyclone-fired boiler, an integral furnace boiler, slurry-handling plant and a high-velocity economic boiler.

Bruce, Peebles & Co., Ltd., are displaying a large scale model of a complete 24 MW hydro-electric scheme, a mural in colour of a 120 MVA, 275 kV transformer on order for the supergrid, a 15 kVA rural transformer, and of particular interest to oil refinery and mining engineers there are flame-proof motors, including a large tube-cooled motor specially developed for oil refineries which is being shown for the first time.

Ferranti, Ltd., has an industrial research organization in Edinburgh connected with light engineering in Scotland which covers the fields of radar navigational aids, special valves and fire control and gyroscopic devices. Its exhibit is therefore mainly concerned with these products, and includes an airstream direction detector, T.R. cells for use in radar systems, an integrated microwave test bench, and a rack for meter calibration tests.

Equipment of particular interest to consulting engineers, waterworks engineers and operators of major processing plants, refineries and waterworks is being shown by the Harland Engineering Co., Ltd., the centre-piece of the stand being a 24in hydraulically operated Rotovalve weighing six tons. Other equipment exhibited includes a range of centrifugal pumps, electrical machinery and hydro-electric plant.

Many products manufactured at its Hamilton works are displayed by Philips Electrical, Ltd. The greater part of the exhibit is devoted to the many types of lamps produced, and other items of interest are an instant-self-start circuit, which is compared with the standard switch-start circuit, and the "Philishave" dry shaver.

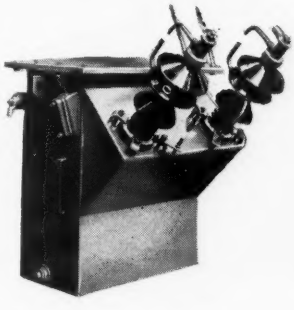
Instruments produced at their Glasgow works form the display of Kelvin & Hughes, Ltd., among which are a loss meter, a flue gas analyser, circular chart recorders, shadowless lamps, and the "Fugitormeter" for fading tests under stable conditions of temperature and humidity.

A wide selection of equipment is being shown by British Electrical Repairs, Ltd., including armature stator transformer coils, generators, slip rings, commutators, solenoids and tapping switches.

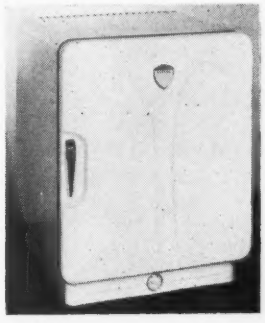
A comprehensive range of switch and control gear with enclosures to suit conditions in all industries form the display of M. & C. Switchgear, Ltd. Another concern showing switchgear is the Belmos Co., Ltd., which includes industrial and flameproof gear, motor starters and signalling systems, while W. & H. Nelson, Ltd., include in their display "Nelbest" flameproof and non-flameproof equipment.

Transformers of all types up to 7 kVA, and industrial electronic equipment for timing, counting and batching are featured by Atkins, Robertson & Whiteford, Ltd., and portable and wall-mounting transformers suitable for low voltage lighting and portable machine tools are displayed by John Drummond (Engineers), Ltd.

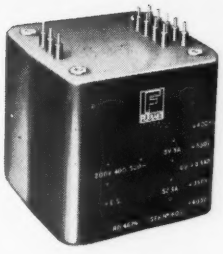
While the Wallacetown Engineering Co., Ltd., specializes in the design and manufacture of flameproof air-break



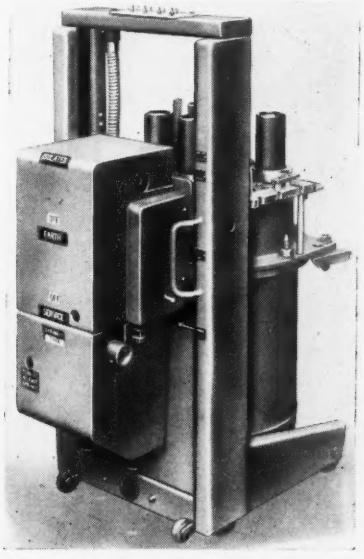
Above : Bruce Peebles 15 kVA rural transformer



Above right : Astral refrigerator



Right : Ferranti multiple output power transformer rated at 164 VA at 500 c/s



Circuit breaker carriage unit for Met-Vick vertically isolated switchgear

switch and control gear for collieries and mines it also produces a comprehensive range of medium voltage equipment for surface use and its exhibit includes, in addition to flameproof units, a switchboard of single and double tier cubicle formation, and a pillar type control panel.

The Weir group of companies has two stands. One shows land and marine power plant auxiliaries and valves for special duties, while the other is devoted to the products of Drysdale & Co., of Yoker. Fredk. Braby & Co., Ltd., include aluminium alloy trays in their display.

On the domestic side, electric water heating and electric oil heating appliances are being shown by Duncan Low, Ltd., including flameproof immersion heaters and flameproof radiators. Two $1\frac{1}{2}$ cu ft refrigerators are shown by Astral Equipment, Ltd., the freestanding model and a table model, thermostatically controlled, for operation by town gas, electricity, or calor gas. Metal kitchen cabinets and fitments form the display of Ezee Kitchens, Ltd., among which are a sink unit with a built-in " Mark I " Hoover washer and a similar unit with built-in Prefect washer which has a power wringer and electric wash boiler elements as an optional extra. An electrically operated stand wringer is being shown by Acme Wringers, Ltd. British National Electrics, Ltd., is showing its electric cookers and fires, including model F104, reflector type. The " Falco-Buxton " and the " Falco-Petite " cookers, and two Falco fires are among the exhibits of Allied Ironfounders, Ltd., while the Scottish Precision Engineering Co. is displaying its " Superflow " heat-controlled iron.

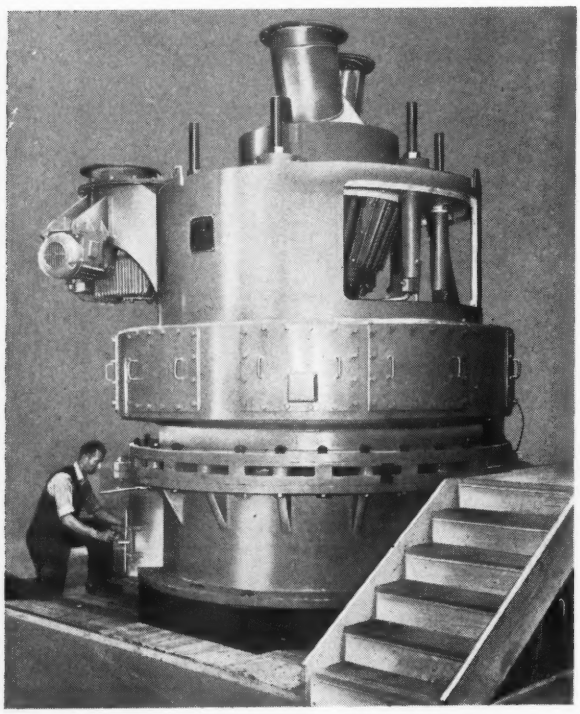
The three Scottish Electricity Boards have organized a display jointly with E.D.A. in demonstrating the part played by electricity in the drive for increased productivity.

The cable industry is represented by Scottish Cables, Ltd., and the Craigpark Electric Cable Co., Ltd. Internal push-button telephones are on show by Modern Telephones (Great Britain), Ltd.

James Kilpatrick & Son, Ltd., render an electrical engineering service for all types of consumers both at home and abroad and the main exhibit is a pictorial display of this service.

Prefect washer (Ezee Kitchens, Ltd.)

A type " E " Babcock & Wilcox coal pulverizing mill being assembled on the stand



Kirkcaldy All-Electric Flats

IT is announced that the Scottish Department of Health has approved the Kirkcaldy Corporation's proposal for the erection of all-electric flats on the Templehall housing estate and construction of an eight-storey block—the prototype for a further five—has now commenced. The flats are to be built by George Wimpey & Co., Ltd., and each block will comprise 48 flats, particular interest attaching to the use of electric floor heating.

There will be no fireplaces or chimneys. In each flat the living room and the hall will have " Panelec " floor heating which is designed to provide an equivalent comfort effect of 60 deg F. The Kirkcaldy Corporation is to provide an electric fire of the radiant " coal effect " type in the living room of each flat and there will be socket outlets in the bedrooms so that tenants may install other electric fires if desired. Electricity for floor heating and water heating will be made available on the South East Scotland Electricity Board's " off-peak " tariff at an inclusive rate of 0·7d per kWh during the hours 7 p.m. to 7 a.m. with a mid-day boost from 11.30 a.m. to 3.30 p.m.

Each flat will be provided with a 30 gall hot water storage cylinder fitted with a 3 kW immersion heater and thermostat time switch controlled on the same circuit as the floor heating. The combined electricity consumption for floor heating and water heating will be separately metered in each flat. There will be a drying room on each floor in which grilles will be provided and it is intended to experiment with natural ventilation for drying purposes, but in the event of this method being unsuccessful electric drying cabinets will be installed. Each flat will be provided with an electric cooker.

The heat losses on the ground floor, intermediate floors and top floor are, of course, different and the following are the proposed floor heating loadings:—

	Three-roomed flats	Two-roomed flats
Ground floor flats...	3 at 4·1 kW	3 at 3 kW
Intermediate flats...	18 at 3 kW	18 at 2·6 kW
Top flats	3 at 4·85 kW	3 at 3·75 kW

It is estimated that the cost of floor heating for a season of 210 days will average approximately £14 per annum per house and the water heating at £10 per annum per house.

The capacity of an adjacent substation will be increased by 300 kW in order to supply the flats and the main electricity service will be taken to a room on the ground floor. Six pairs of vertical rising mains will be taken from this central position, each pair supplying eight flats. One of the rising mains will supply the ordinary peak load requirements. The other will supply the " off-peak " loads.

INDUSTRIAL NEWS

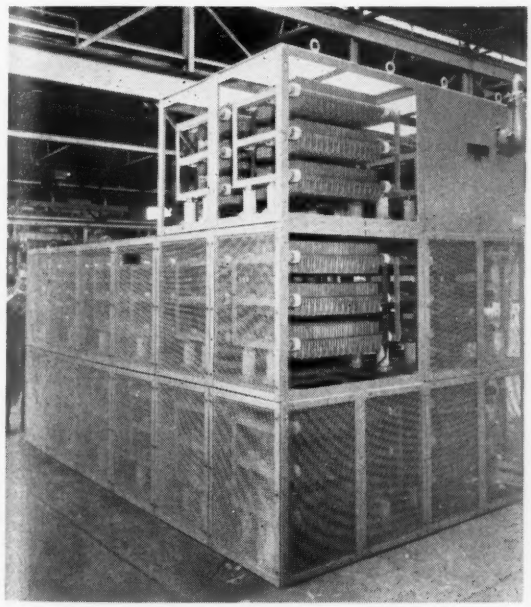
Gauge and Tool Makers

The annual report of the Gauge and Tool Makers' Association, which is to be presented at the annual meeting to be held on 14th September at the Savoy Hotel, London, states that there are now 306 member firms. Contact has been maintained with other organizations and societies and the Association has re-joined the Federation of British Industries. The fourth competition in craftsmanship and draughtsmanship for apprentices and learners attracted entries from all over the country and the prizes and certificates will be presented by the president and chairman of the Association at the luncheon which precedes the annual meeting. The Export Committee completed in May last a third edition of the Association's export catalogue in English, French and Spanish, and an initial 7,000 copies have been circulated abroad to such authorities as trade commissioners, consulates, embassies, and importers of tooling equipment. The Handbook and Buyers' Guide Index (fifth edition) has been sent to prospective purchasers of British tools and gauges at home and overseas. A sixth edition will be issued at the end of the current month. Reference is made in the report to the success of the Gauge and Tool Exhibition held in May last at the New Horticultural Hall, Westminster.

Large Earthing Resistance

The accompanying illustration shows a large h.v. neutral point earthing resistance recently supplied by E.M.B. Co., Ltd., of West Bromwich, for use in South Africa. It is made up from interchangeable units, each being built up on angle iron framework carrying the resistance units.

The resistance is designed for use between the neutral point and earth of an 11 kV three-phase system. In the event of a dead earth it will limit the initial current to 2,500 A and is rated to carry this current for 30 sec. The grids are carried on mica insulated rods using porcelain primary and secondary insulation. The complete assembly is tested to 16·3 kV a.c. between grids and framework for one minute in accordance with B.S. 162.



E.M.B. 11 kV earthing resistance for South Africa

Rear Lamps and Reflectors

An Order has been made by the Minister of Transport and Civil Aviation fixing the dates on which cars, goods vehicles, and various other vehicles except cycles, are required by the Road Transport Lighting Act, 1953, to have two rear lights. The dates are: New vehicles, 1st October, 1954; existing vehicles (with certain exceptions), 1st October, 1956. Among the vehicles excepted are existing buses and coaches and temporary visitors' vehicles. Existing buses and coaches are omitted because they are brightly lit inside and often illuminated outside as well. The Order also fixes the dates when lamps on pedal cycles, tricycles, and motor cycles must conform to the new Regulations. For new vehicles the date is 1st October, 1954; for existing machines, it is 1st October, 1955. Another requirement of the Act which comes into force on 1st October this year is that all vehicles, new or old, must have reflectors.

City and Guilds Institute

The latest report of the Department of Technology of the City & Guilds of London Institute covers the nine months ended 30th September, 1953, the Institute's year having been changed from the calendar to the "educational" year. The total number of candidates examined at home and overseas showed a marked increase — from 77,951 to 82,287—the reasons for which are not readily discoverable, though the addition of new subjects may have accounted for part of it. The examination results for 1953 are recorded in a separate booklet, but the report contains a tabular summary. Information is also given of new schemes and developments, followed by details of existing subjects grouped under broad industrial headings.

The Institute has also published its "Prize List, 1953"; "General Regulations" (including 1954–55 calendar and timetable and fees for 1955 examinations) and "Regulations and Syllabuses: Telecommunications and Electrical Subjects, 1954–55," copies of which may be obtained from the Department at 31, Brechin Place, London, S.W.7.

Radiators for Shin Tunnel Project

Dimplex, Ltd., has delivered 250 of its electric radiators to George Wimpey & Co., Ltd., at the Shin tunnel project, Invershin, Sutherland. The radiators, consisting of 200 2 kW models and fifty 500 watt models finished in gold, cream and bronze, will be installed in the living quarters of the men working on this new hydro-electric scheme. The order was placed by the Edison Swan Electric Co., Ltd., Dundee, through the Dimplex distributors for Scotland, A. Caldwell Young & Son, Glasgow.

Television Equipment for Italy

Following upon a contract signed in 1952 for the supply to Italy of Marconi Band III television transmitters, together with studio and outside broadcast equipment, Marconi's Wireless Telegraph Co., Ltd., has announced that a substantial repeat order has been obtained. The new contract, placed by Radio Audizione Italiana through Marconi Italiana, covers complete equipment for two further television outside broadcast units, the equipping of another two-camera studio, and a large quantity of monitoring apparatus. It calls for the provision of eight camera channels, three sound and three vision mixers, twenty picture monitors, ten picture and waveform monitors, six line strobe waveform monitors, five microwave links and ancillary equipment.

Batteries for "Saxonia"

Four batteries of "Alklum" steel alkaline cells supplied by Britannia Batteries, Ltd., have been installed on the new Cunard liner *Saxonia* to power the shipboard d.c. services. The largest, a 225 V, 220 Ah capacity battery of heavy duty marine type cells, may be called upon to meet a load of 200 A imposed by emergency lighting and auxiliary services for

thirty minutes. The special charging/control gear automatically connects the circuits to the battery upon failure of the ship's mains supply. A 25 V, 65 Ah marine battery caters for the low pressure services and two 24 V, 32 Ah batteries have been installed for the ship's telephone system.

Baghdad Fair Catalogue

The official catalogue of the British Trade Fair, Baghdad, to be held from 25th October to 8th November, has now been printed and is on its way to the Middle East. Its production, by Associated Iliffe Press for the organizers, British Overseas Fairs, Ltd., presented some unusual problems in that the catalogue had to be designed to cater equally for the English-speaking inhabitants of the Middle East and for the Arabic-speaking population in Iraq and neighbouring countries. Thus it is virtually two catalogues in one cover, English reading from front to centre; Arabic from back to centre, each complete in itself. Its total of more than 500 pages contains the descriptive entries of the Fair's 450 exhibitors; fold-out plans of the exhibition with, on the reverse side, classified lists of exhibitors arranged under trade groups; messages from Sir Harry Pilkington, president of the Federation of British Industries, and Mr. Peter Thorneycroft, P.C., M.P., President of the Board of Trade; and an explanation of the purpose of the Fair and its facilities. The number of copies of the catalogue printed is 10,000 and a special copy bound in white calf with gold lettering will be presented to King Faisal II when he opens the Fair on 25th October. Demand for the catalogue at the Fair is expected to be so heavy that no copies are available for distribution in this country. It may be examined at the offices of the Fair's official publicity agents, O'Sheas, Ltd., 101, Fleet Street, London, E.C.4 (telephone: Central 1359).

Refresher Course for Plant Engineers

A comprehensive refresher course for senior works and plant engineers on Tyneside, sponsored by Sir Claude Gibb, has been organized by the Incorporated Plant Engineers through its Education Committee. The course is designed to encourage the most effective use of existing knowledge and to promote the application of up-to-date techniques in works engineering practice over a wide field. It will comprise nineteen weekly lectures, held on Tuesday evenings, commencing on 19th October at King's College (University of Durham), Newcastle-upon-Tyne, and will include planned maintenance; transmission of mechanical energy; lubrication; combustion and steam raising; space heating; steam utilization; generation of power from process steam; switchgear, motive power and control; industrial lighting; electrical safety precautions; metallurgical aspects of plant; materials handling plant; compressed air plant, and pumping plant. The fee for the course is three guineas and copies of the syllabus and full particulars can be obtained from the secretary to the refresher course, Stephenson Building, Claremont Road, Newcastle-upon-Tyne, 2.

"Lighting to Measure"

A new edition of the booklet, "Lighting to Measure," has been published by the British Thomson-Houston Co., Ltd. It shows the housewife how to improve the lighting in her home by using a tape measure and following simple illustrated instructions. The measurements in the booklet have been scientifically calculated and tested, and apply equally to lighting in homes furnished in contemporary or traditional styles. A special section gives useful reminders on the supply of electricity, its cost, and how to read a meter. The booklet is obtainable from the Lamp Advertising Dept., 18, Bedford Square, W.C.1.

Trade Announcements

The Manchester and North Midlands branch office of the **John Thompson** group of companies is moving to larger premises on 1st October. The new address will be 6th Floor, Sunlight House, Quay Street, Manchester, 3 (telephone: Deansgate 6151/2).

Mr. J. E. Earle, formerly with Tenaplas, Ltd., has been appointed sales representative for **Hellermann, Ltd.** The company is now handling all the sales of plastic extrusions made by its associate company, Cheltenham Plastics, Ltd. A new department has been set up under the heading "Plastic Extrusion Division" which will be in the charge of Mr. C. E. D. Catley. Mr. Catley remains as general manager of Cheltenham Plastics, Ltd.

Coombes, Gorring & Co., Ltd., have been appointed sole selling agents for "Cravat" display tables and stands, electrical fittings, hanging gardens, plant and posy vases, etc., manufactured by M. J. Feather, Ltd., of Yorkshire.

The **Davis Sheet Metal Engineering Co., Ltd.,** has acquired a new and larger factory and its new address is Eley Estate, Angel Road, Edmonton, N.1 (telephone: Edmonton 2492).

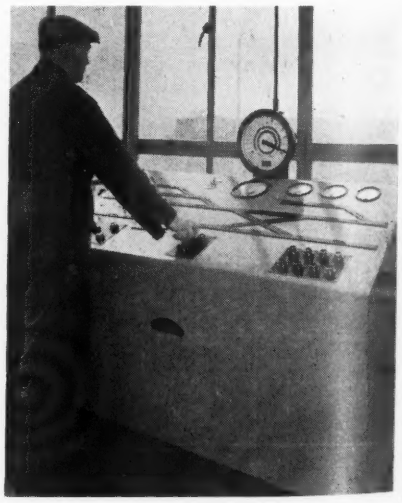
Push-Button Shunting

THIS country produces about 210 million tons of coal every year and all but 20 million tons of this is distributed throughout the country by rail. Every week British Railways uses about 60,000 railway wagons for carrying coal, so considerable interest is attached to a new automatic system of handling trains of wagons in marshalling yards by push-button control which has been developed by Mitchell Engineering, Ltd. The first installation in this country, which is also the first of its kind in the world, was recently completed at the British Electricity Authority's power station at Leicester and a similar installation has been laid out at the National Coal Board's central coal preparation plant at Dalkeith.

One of the main advantages of the system is that it can cut by half the site area required, thus halving the first cost of the site, the cost of the sidings and their maintenance and reduces the length of track normally required. It also saves manpower; at Leicester, for example, two men can handle 800 tons of coal an hour, which would normally require about 20 men. Furthermore, the use of locomotives is practically eliminated. The system can be operated 24 hours a day in all weathers and it makes for far safer operation since there is no manhandling and therefore less risk during loading and marshalling of wagons. When the system is in operation incoming wagons are taken from their sidings by mechanical handling plant, loaded or unloaded, weighed, and returned to the same sidings or to others without the use of locomotives or capstans. The whole operation is performed by electrical control supervised by operators in control cabins on the site. The only non-automatic function is the coupling and uncoupling of wagons in sidings. There is no limit to the size or capacity of the system.

In both the Leicester and Dalkeith installations all motions of the wagon-moving devices are operated by electric motors controlled by push-button switches or drum-type controllers. Automatic controls are incorporated so that, where necessary, a sequence of operations can be carried out after only one operation of the motor-starting switch or controller. Further automatic electrical safeguards and interlocks are provided to ensure the safe and correct operation of the plant.

The control desk at Leicester embodies a mimic diagram of the plant



VIEWS on the NEWS

By REFLECTOR

AN interesting point was raised by Ald. W. J. Bennett, chairman of the Eastern Electricity Consultative Council, at last week's meeting. When an overhead line is extended to supply premises in a rural area the Board is required to provide a specified length of service free. The Board may, however, at its discretion run the line either on one side of the road or the other, so that occupiers of houses on one side might arbitrarily have to pay more than those on the other. With Solomonic wisdom the Board therefore solves the problem by taking a theoretical point in the centre of the road for the purpose of calculating the payments.

* * *

Another matter raised at the same meeting was the contentious question: When is a house not just a house; when does it become a boarding house, guest house or private hotel? On the answer depends the decision whether to apply the domestic or the commercial tariffs for electricity purposes. In the particular case under discussion the Southend, Westcliff-on-Sea and District Hotel and Catering Association had asked the Council to support its application to the Eastern Board for special concessions for private hotels and boarding houses with less than ten rooms, pointing out that another Board appeared to treat them as domestic premises if there were no dining room open to the public. It was reported that the Eastern Board's observations were being obtained. As this is a problem that has been with the electricity authorities for many years, even before nationalization, I will not venture to suggest a solution, but if anything can be done to convince the proprietors of such premises that electricity is not a luxury—for example, that it is quite unnecessary to light bedrooms with 15 W lamps—it will have my blessing.

* * *

A news item shown me by the Editor reads as follows:—

> Henley's have recently erected 4¾ miles of 11 kV three-phase single-circuit overhead line between Dogdyke and New York, and three-phase, four-wire, 415/240 V lines in New York itself.

Corroborative evidence is afforded by a photograph of New York Post Office, but of course it is quite a modest building, not a skyscraper. This New York is only 10 miles north of Boston, not Massachusetts but Lincolnshire, and the work has been carried out by Henley's for the East Midlands Electricity Board's Lincolnshire Sub-Area.

* * *

I rather like the term used in Australia for the windmill generators, viz., aeropower stations. A correspondent tells me that research has begun along the South Australian coast to determine their economic possibilities. Adelaide, in particular, he says, is ideally situated for the purpose because of the direction of the prevailing winds. The South Australian Electricity Trust has pegged out a number of experimental sites along the coastline between Adelaide and Victor Harbour, and "landholders have co-operated splendidly, willingly giving access to property and undertaking voluntarily to look after the equipment." Preliminary results of the first tests should be available some time next year.

* * *

Strenuous objections in bygone days to the erection of overhead power lines undoubtedly held up rural electrification in this country, the need for which is now generally appreciated. Setbacks may in the end, however, bring their own compensations. In this case, Dr. Willis Jackson suggested last week at the British Association meeting, the obstruction met with in this way may have brought about the early establishment of the cable-making industry here. If so the opportunity taken by that industry in its initial stages to evolve to a position in which it has shown its ability to meet all demands of the future as well as of the present has proved to be an invaluable national asset.

* * *

I am indebted to a Sevenoaks correspondent for the following electrical hint contained in the "Seal Parish News":—

> *Last Longer.*—I find that a pan lid hammered flat and used on the hot-plate of an electric stove lasts longer than anything else and you can wash it far cleaner than the mats one buys.

So far I have been chary of showing this to my wife, otherwise I might possibly have discovered the purpose of it all.

* * *

Many unkind things have been said about power stations by people who live near them. The following extract from a comment in the *South Wales Evening Post*, however, indicates that such is not the case with regard to the new power station at Carmarthen Bay:—

> ". . . it is an outpost of massive industrialism in a countryside of decaying minor ports, farms and the fringe of coal and steel interests. It is the westernmost token in Wales of this Age of Electricity . . . the power station, clean-limbed, neat, planned with an eye to architectural effect is like the modern factory, a newcomer whose aspect will be more and more accepted as welcome. Carmarthen Bay power station should have a tonic effect in its area."

* * *

Most of the news items in the *Electrical Review* of 7th September, 1894, were concerned with lighting. "The electric light," it is said, was "well received" at Portsmouth; a supply of electricity was in prospect at Dover; and rival schemes for gas and electric lighting were under consideration at Winchester. A more advanced use of electricity, however, is also recorded:—

> "Messrs. Crompton & Co. are showing electrical heating and cooking at the food and cookery exhibition, Manchester, and their demonstrations are creating great interest. Several dinners have been cooked and chops and steaks are supplied daily to visitors. The new electric grill recently introduced cooks to a nicety, at a small expenditure of current. Messrs. Crompton have been awarded a gold medal."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

In our issue of 27th August we reported the formation by British Insulated Callender's Cables, Ltd., and W. T. Glover & Co., Ltd., of a new company, British Insulated Callender's (Submarine Cables), Ltd., to specialize in the design and manufacture of submarine power cables.

Mr. K. S. Brazier, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., who has been appointed a director and works manager of the new company, received his technical training at the City and

Mr. K. S. Brazier

Mr. E. L. Davey

Guilds (Eng.) College, London, and joined Callender's Cable & Construction Co., Ltd., in the Outside Testing Department, later transferring to the Research Department. In 1940 he joined W. T. Glover & Co., Ltd., Trafford Park, as assistant works manager, and in 1946 was appointed works manager.

Mr. E. L. Davey, B.Sc.(Eng.), M.I.E.E., who has been appointed a director and is also chief engineer, received his technical education at East London College and obtained a first class honours London University B.Sc. engineering degree. Subsequently he served a college apprenticeship course with the Metropolitan-Vickers Electrical Co., Ltd., and became an assistant in the high voltage section of the Research Department. Later he joined W. T. Glover & Co., Ltd., as research and development engineer and in 1946 was appointed power cable engineer until 1950 when he became chief engineer of the company. In 1952 Mr. Davey was seconded by the Glover Co. to be executive chief engineer to the Projects Engineering Panel of the B.I.C.C. group to carry out, on behalf of the B.E.A., the development and sea trial work for the proposed cross-Channel cable link.

Mr. Davey has served on the main I.E.E. Supply Section Committee for several years, has served on the North Western I.E.E. Supply Section Committee both as a member and chairman and was joint author of an I.E.E. paper on the gas filled cable for which he was awarded the Institution Premium in 1943. He has also served on many technical committees and has been responsible for a number of patents in the power cable field. He is the author of a number of technical papers and articles.

Mr. W. A. Hartop, works director of George Kent, Ltd., left England on 9th September for a two-month stay with the Kent subsidiary in Canada, Kent-Norlantic, Ltd., Toronto. The main object of his visit is to assist the production organization of Kent-Norlantic towards full operation and also to investigate further export prospects for George Kent products. He will be visiting Kent-Norlantic agencies in various Provinces, covering the whole of Canada to the Pacific seaboard.

The General Electric Co., Ltd., has appointed **Mr. J. S. Langlands** as assistant manager for Scotland. Mr. Langlands, whose early training was received in Clydeside engineering shops, joined the G.E.C. in 1933. During the war he was with R.E.M.E., at one time as senior technical liaison officer between the War Office and U.S. Forces in Europe; later he became Commandant, Rawalpindi Area, India, with the rank of colonel. In 1948 he was appointed managing director of the British General Electric Co. (Canadian), Ltd. Mr. Langlands has been vice-president of the Canadian Association of British Manufacturers and Agencies.

Mr. J. S. Langlands

In our last issue we briefly noted appointments made to the Stella South, Stella North, Dunston "A" and "B" and Blaydon power stations of the North Eastern Division, British Electricity Authority.

Mr. W. F. Cusworth, B.Sc., A.M.I.E.E., who has been appointed power station superintendent at Stella South, was previously superintendent at Dunston "A" and "B" and Blaydon power stations. He joined the North Eastern Electric Supply Co. as an assistant engineer, following his demobilization from the Royal Navy in which he served during the last war as a lieutenant. He was appointed deputy power station superintendent at Dunston in 1951 and became superintendent in January this year.

Mr. W. F. Cusworth

Mr. T. E. Loraine, A.M.I.E.E., who succeeds Mr. Cusworth as power station superintendent at Dunston "A" and "B" and Blaydon, was educated at Darlington Technical College and served his apprenticeship with the Darlington Forge Co. He had experience with various industrial concerns including A. Reyrolle & Co. Ltd., before entering the electricity supply industry in 1935. Before vesting day he held appointments at Darlington, Preston and York power stations and transferred to Carville in 1949. He was appointed superintendent of Carville in 1951 and deputy power station superintendent at Dunston in February this year.

Mr. T. E. Loraine

Mr. C. R. Garnett, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., has been appointed superintendent at Stella North power station. He received his early education and training at Lincoln Technical College and University College, Nottingham. After service in the Royal Naval Volunteer Reserve during the war, he joined the North Eastern Electric Supply Co. in 1946 and served at Carville and Dunston "A" power stations before joining the divisional headquarters staff. Following a period at Dunston "B" he was appointed senior assistant engineer to the chief generation engineer (operation) and in this capacity has been closely connected with the design of the Stella power stations.

Mr. C. R. Garnett

Mr. R. S. Jones, M.I.E.E., manager of the Plant Sales Department of the British Thomson-Houston Co., Ltd., has retired after forty-two years' service with the company. Following upon technical courses at Gordon College, Aberdeen, and Royal Technical College, Glasgow (Diploma Elecl. Engg.), Mr. Jones spent his first two years with the B.T.H. Co. in the Testing Department gaining considerable

experience as tester-in-charge of the heavy machine sections. He then spent a period in the Special Engineering Department under the leadership of Mr. (now Sir) Wm. Larke, before joining the A.C. Engineering Department in 1916, to concentrate on the design of both induction and synchronous motors of large sizes. In 1919 Mr. Jones joined the commercial engineering staff to specialize in heavy plant drives, notably for rolling mills, and was appointed manager of plant sales in 1936.

Mr. R. M. Grant, B.Sc., M.I.E.E., succeeds Mr. Jones as manager of the Plant Sales Department. After graduating at Glasgow University (gaining honours in Electrical Engineering and the diploma in engineering economics) Mr. Grant served a three-year graduate apprenticeship with B.T.H. on completion of which, in 1932, he joined the company's construction staff (London district). In 1936 he returned to Rugby to take up a commercial engineering appointment in the Plant Sales Department, with particular responsibility for rectifier contracts. Since 1946 Mr. Grant has

Mr. R. S. Jones

Mr. R. M. Grant

been closely identified with contracts for hydro-electric equipment, and in 1952 was appointed assistant manager of the department of which he now becomes manager. He has visited many countries abroad on behalf of B.T.H. and has contributed technical articles to home and overseas journals in addition to the presentation of technical papers to professional institutions.

The Birmingham Branch of the **Electrical Industries Benevolent Association** is holding its annual carnival dance at the G.E.C. Magnet Club, Witton, Birmingham, on 8th October (8.0 p.m. to 1 a.m.). Tickets will shortly be available, and can be obtained from the hon. secretary, Mr. L. Wall, Electrical Components, Ltd., Ludgate Hill, Birmingham, 3, or from any member of the committee.

The following appointments have been made to the administrative staff of Foster Electrical Supplies, Ltd., one of the Lancashire Dynamo Group of companies:—**Mr. L. D. Gunnell,** who has been London manager for the past twenty years has been appointed general sales manager of the company. Before taking over the management of the London branch, he was responsible for the opening of the company's Birmingham branch, where he remained for some ten years. **Mr. E. A. Ellerton,** who is responsible for internal administration, becomes commercial manager. **Mr. A. C. Ball,** who has represented the company for the past thirty-one years in London and the South-Eastern Counties, has been appointed London branch manager. **Mr. Milton Ely,** C.B.E., continues as chairman and **Mr. R. V. Ely,** M.I.E.E., M.I.Mech.E., as managing director.

Mr. A. W. Welton has been appointed to the board of directors of Mullard, Ltd. He has been continuously associated with the Mullard group of companies since he joined the Mullard Radio Valve Co., Ltd., in 1923. He is already a director of Mullard Overseas, Ltd., and Mullard Wireless (Near East), Ltd.

Mr. A. W. Welton

A Freeman of the City of London, Mr. Welton is also chairman of the Radio and Electrical Trades' Guardian Association and a member of the Institute of Credit Management.

The Southern Area Final of the **E.I.B.A. Golf Championship** took place at High Post Golf Club, near Salisbury, on 1st September. The winner of the handicap prize, Mr. K. P. Harris, also had the best gross score, gross 70, less 3 handicap—67. The runner-up, Mr. H. J. Holton, had a gross 77, less 8—69. Mr. L. Chittenden was awarded the scratch prize with a gross 75, as it is a rule of this competition that no competitor may take more than one prize. These three representatives will now go forward to compete in the national finals at Moor Park on 4th October, together with one or two competitors for the veteran's trophy.

Mr. B. C. Fleming-Williams, B.Sc., has been appointed general manager of Sylvania-Thorn Colour Laboratories, Ltd. After some years of research on vacuum engineering at London University Mr. Fleming-Williams joined the lamp works of the Edison Swan Co. in 1931 and was concerned with putting high pressure mercury vapour lamps on the market. In 1935 he joined A. C. Cossor and was responsible for the double beam cathode-ray tube which he patented, returning to London University in 1938 to undertake some research on plastics for the Electrical Research Association.

Mr. B. C. Fleming-Williams

In 1940 he re-joined A. C. Cossor to work on beam deflection valves and airborne radar equipment and later was in charge of the first marine radar equipment. As director of research with A. C. Cossor he was responsible among other things for the large airfield control radar system now in operation at London Airport. Mr. Fleming-Williams commences his new duties on 13th September.

Mr. G. H. M. Houston, B.Sc., A.M.I.E.E., has joined Brookhirst Switchgear, Ltd., as manager of its Power Applications Branch as from 1st September. This extension of the Brookhirst organization has been established progressively to develop the application of motor control gear for power station auxiliaries and kindred applications, to meet the changing demands of modern power station design both at home and abroad. Mr. Houston and his engineering staff will be at Universal House, Buckingham Palace Road, S.W.1.

After some years' service with the British Thomson-Houston Co., Ltd., Mr. Houston joined the London Power Co. in 1928 and, except for an interval during the last war when he was engaged with the Air Ministry, has since then been engaged on power station construction. Before joining the Brookhirst organization he was electrical engineer responsible for design of electrical equipment in the generating stations of the B.E.A. London Division.

Mr. Donald McDonald, B.Sc., F.R.I.C., M.I.Chem.E., F.I.I.A., F.I.M., chairman of the Executive Committee of the board of Johnson, Matthey & Co., Ltd., since 1950, retired on 31st August after forty-four years' service with the company. Mr. McDonald joined the company direct from University College, London, in 1910 as a junior chemist and in 1920 was appointed manager of the refineries at Hatton Garden. In 1939 he was appointed to the board as director of the Bullion Department and of Research, adding to his duties in ensuing years the directorship of labour management and mechanical production. Mr. McDonald has published an authoritative account of the life of the founder of the company, Percival Norton Johnson, and has recently been engaged upon the compilation of a detailed history of platinum from its discovery until the 1880s. At a brief ceremony in the recently completed Hatton Garden office block, in the construction of which he was closely associated, Mr. McDonald was presented with a

Mr. D. McDonald

cheque and a bound book of signatures of his colleagues and friends throughout the company.

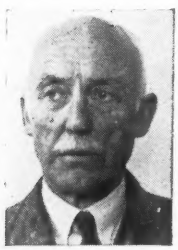
Mr. L. A. Jackson, F.C.I.S., who since 1948 has been head of the administrative section of the secretary's department of the Eastern Electricity Board, has now been designated as deputy secretary of the board. Before vesting day Mr. Jackson was with Edmundsons Electricity Corporation, Ltd., where he occupied the position of secretary and assistant secretary of a number of associated companies. Since 1949 he has served as secretary of the Eastern Electricity Consultative Council but in consequence of his new appointment he is now relinquishing these duties which are to be undertaken by **Mr. F. W. Clarke,** Barrister-at-Law, an assistant secretary (administration) of the Eastern Electricity Board.

Mr. W. Briggs has been appointed a director of Erskine, Heap & Co., Ltd. He is at present manager of the Contracts and Estimating Department. He served his apprenticeship and has spent all his working life, with the exception of a time spent on active service abroad during the 1914-18 war, with the company and has now completed forty-three years of service. He received his technical training at the Manchester College of Technology.

Mr. W. Briggs

The annual Golf Tournament arranged by the Merseyside and North Wales Branch of the **Electrical Industries Benevolent Association** was held at Heswall Golf Club on 1st September. The winner of the competition was Mr. G. A. Baker (of Sangamo Weston), who thus qualifies to play in the national final. As a result of the day's activities, the branch raised the sum of £425 for the Benevolent Fund.

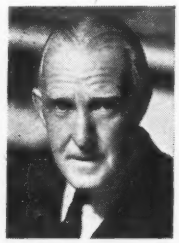
Mr. S. M. Hill.—We regret that in referring to Mr. S. M. Hill's retirement from the position of generation engineer (operation) of the South Western Division, B.E.A., in our last issue, we inadvertently published the portrait of another gentleman of a similar name. We now reproduce the portrait of Mr. Hill, who informs us that he is no longer an associate member of the I.E.E.



Mr. S. M. Hill

OBITUARY

Sir John Kennedy.—It is with regret that we have to record the death, at the age of seventy-four, of Sir John Macfarlane Kennedy, O.B.E., M.I.C.E., M.I.E.E., a past president of the Institution of Electrical Engineers, and for many years one of the leading figures in the electricity supply industry.



The late Sir John Kennedy

Sir John was educated at Trinity College, Cambridge, and received his technical training at Zurich Polytechnic and Cambridge University. He served his pupilage with Richard Moreland & Sons, London, Willans & Robinson, Rugby, and Siemens-Halske, Berlin. From 1902 to 1934 he was partner in the firm of Kennedy & Donkin and was engaged on electricity supply, distribution and traction networks, being responsible for the first electrification of the L.C.C. Tramways, the Hammersmith and City Railway, and the Western and Eastern Sections of the Southern Railway. In 1922 he submitted to the Electricity Commissioners proposals for the reorganization of the electricity supply in Great Britain and subsequently prepared a report on the subject for the Ministry of Transport. After the passing of the 1926 Act he prepared for the Electricity Commissioners the technical and financial data upon which the regional schemes were based. He was a member of the Fuel Research Board for four years from 1930, and in 1934 took office as an Electricity Commissioner, becoming chairman in 1947. On his retirement from the Electricity Commission in 1948 he became a member of the Uganda Electricity Board in London and for a period acted as chairman in Uganda during the absence of Mr. C. R. (now Sir Charles) Westlake, M.I.E.E. He retired from the Board in 1952.

Sir John was President of the Institution of Electrical Engineers for 1935-36 and was elected an honorary member in 1943. Among his many other activities he was a past president of the Association of Supervising Electrical Engineers and of the Electric Vehicle Association.

Mr. M. Solomon, F.C.G.I., M.I.E.E.—The death occurred on 1st September of Mr. Maurice Solomon who, until his retirement in 1951, was a director of the General Electric Co., Ltd., and its associated company, Pirelli-General Cable Works, Ltd. Mr. Solomon was born in 1878 and was educated at St. Pauls and the Central Technical College. He joined the Robertson Lamp Works at Hammersmith in 1903 as assistant to Mr. Robertson and was subsequently put in charge of filament making. In 1904 he was transferred to Witton as manager of the Carbon Works. He was elected a director of the G.E.C. in 1915 and of Pirelli-General Cable Works, Ltd., in 1920. Both in 1929 and 1936 he was chairman of the Cable Makers' Association and, in 1932, vice-president of the International Cable Development Corporation, becoming president in 1948, an appointment which he held until his death. In addition to his executive duties Mr. Solomon found time to write a book entitled "Electric Lamps"; he was a regular contributor to "Nature" on electrical subjects; he was editor for many years of "The Central" (the journal of the old students of his college); and he started and edited the "Magnet Magazine" of the G.E.C.

Mr. Charles Turnbull, M.I.E.E., a former borough electrical engineer of Tynemouth, died on 30th August at the age of eighty-four. Mr. Turnbull attended Armstrong College and served his apprenticeship with C. A. Parsons & Co. at Newcastle. On leaving Parsons he went to Scarborough power station, after which he had electrical experience in other districts. He was appointed borough electrical engineer of Tynemouth in 1906, from which position he retired in 1935. Mr. Turnbull was chairman of the North-Eastern Centre of the Institution of Electrical Engineers for 1932-33.

Mr. J. Dyson.—The death occurred on 6th September of Mr. J. Dyson, managing director of J. Dyson & Co., Ltd., electrical and radio wholesalers, Bradford.

WILL

Mr. A. M. Dallen, former secretary to the old Woking Electric Supply Co., who died on 24th May last, left £16,603 gross (£16,484 net).

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £245 10s 0d
Fire Refined 99·70%	ton £244 0s 0d
Fire Refined 99·50%	ton £243 0s 0d
COPPER Tubes ..	lb 2s 4⅜d
Sheet	ton £305 5s 0d
H.C. wire and strip ..	ton £276 10s 0d
LEAD, English ..	ton £100 10s 0d
Foreign	ton £99 0s 0d
MERCURY	flask £100 0s 0d
TIN, block (English) ..	ton £731 10s 0d
ZINC, G.O.B. Foreign	ton £81 10s 0d
Electrolytic	ton £85 13s 0d
BRASS Tubes (solid drawn)	lb 1s 11½d
Sheet	ton £249 5s 0d
Wire	lb 2s 6⅝d
PHOSPHOR BRONZE Wire	lb 3s 10⅜d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 20⅜d–20⅝d

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

The Dearth of Technologists

THE article on " The Dearth of Technologists " and your editorial comment in your last issue are timely and will be welcomed by the many who realize that the electrical engineering profession and industry are likely to be more gravely affected than most, if not all, of the other fields of technology. The Council of the Institution, to whose comments you have referred, continue to give earnest thought to the steps which can be taken to remedy this serious situation, because unless the rate of entry is improved immediately there is danger of an even greater shortage in a few years' time, when there will be smaller numbers of boys and girls in the 16–19 age group.

A conference with headmasters and careers masters, an increase in the number of lectures for young people and the preparation of a careers booklet in popular form, to be ready during the coming autumn, are among the steps so far taken by the Council; others are being worked out, while on the educational aspects the Council is in close touch with the Minister of Education and her officers. The President has pointed out in his addresses to Local Centres, following on his treatment of the subject in his Presidential Address last October, that members of the profession can give effective help by bringing the advantages of a career in electrical engineering to the notice of parents and young people in their own circle. Many hundreds of enquiries and requests for advice are dealt with each year by my staff and we would gladly help many more boys to plan the most appropriate courses of study to suit their needs.

Despite the grave shortage of science teachers and the consequent inadequate facilities in many schools, it ought to be possible by concerted action to avoid a repetition of the unfilled places in Universities and Colleges without the lowering of standard which decreased supply sometimes brings. Conversion courses for boys whose " O " level subjects were not chosen to suit their needs, preliminary University years and other expedients could be brought from the realms of academic discussion into action, if numbers justified such adaptation of our flexible educational resources.

This national emergency, as you rightly call it, can be met first by realization, secondly by action by every engineer and, finally, by co-operation of educationalists who have studied the needs of our profession.

London, W.C.2. W. K. BRASHER,
C.B.E., M.A., M.I.E.E.,
Secretary,
The Institution of Electrical Engineers.

THE leading article in the *Electrical Review* of 3rd September is indeed timely and one to which all concerned should take note for appropriate action!

So far as the electricity supply industry is concerned you will no doubt be aware of the " near emergency " which has already arisen in so far as the Electrical Power Engineers' Association has given the central authority six months' notice to terminate the N.J.B. agreement.

This particular agreement governs the salaries of technical staff within the industry and dissatisfaction with the salary scales became so widespread that drastic action became necessary.

To give a concrete example, a district commercial engineer carrying responsibilities for upwards of 70,000 consumers of all types, operating a contracting section with upwards of 50 employees and supervision of service centres in his area with sales of over £100,000 per annum would be " rewarded " with a gross salary of approximately £1,000 per annum at the present time!

Apart from the salary question, increasing irritation is being experienced owing to the long delays in negotiations and the reluctance of some area boards to operate national decisions.

It is not surprising that urgent problems of staffing are now being experienced.

The young man of to-day will not undergo a long and arduous training for the poor rewards that are offered.

Liverpool. " OBSERVER."

Variable-Speed A.C. Drives

IT is unfortunate that Mr. A. T. Robertson's article in your issue of 27th August seems to be unduly biased against the d.c. motor drive, whether used with a rotating convertor or mercury arc rectifier. Too much space would be needed to deal in detail with several of his statements which, though mainly true, are capable of misinterpretation; but one or two specific points must be mentioned.

First, experience of several hundred rectifier d.c. motor drives has shown that maintenance of the associated electronic equipment is well within the capacity of normal staff, and that the d.c. motor in practice requires less attention than the a.c. machine. Indeed, the annual replacement bill for new brushes alone for an a.c. commutator motor may far outweigh any possible saving in first cost.

Secondly, a d.c. motor may readily be designed to have any desired characteristic to suit its load, and can also be reversed with ease if necessary. The ability to share load is not a feature peculiar to the a.c. series-motor, nor is the stator fed a.c. commutator motor unusual in having a moderate speed regulation; although both facts might be (incorrectly) deduced from Mr. Robertson's statements.

On the mechanical side the d.c. motor with variable armature voltage has much to commend it, not least being the fact that it is the smallest driving unit and one which is capable of a variety of mountings and enclosures, useful features where space is restricted or special protection is necessary against dirt or hazardous vapours.

There is of course no really simple answer to the problem of selecting variable speed drives but the increasing use of d.c. machines is adequate proof that they compare very well indeed with more complex and larger machines.

London, S.W.1. K. B. BLAKE,
B.Sc. (Eng.), A.M.I.E.E.

Clutha River Diverted

The diversion of the Clutha River, New Zealand, at the Roxburgh dam site was recently completed though at one stage it was feared that the river would be too swollen, by heavy rain in the mountains, to permit the work to go on. The next task will be to construct another coffer dam across the river just above the lower end of the diversion channel, to complete the sealing-off of that part of the river bed which will contain the permanent dam.

Domestic Electrical Equipment

Electric Fires

THANKS first to the improvement in the electricity generation position, which even makes electric heating a welcome load spreader at certain periods, and secondly to the welcome reduction in purchase tax from 75 to 50 per cent at the beginning of the year, the outlook for the electric fire market is more promising than it has been at any time since the war.

The position is reflected by the large numbers of new models which have already made their appearance or are now being introduced in readiness for the coming winter. What with the hundred or so new models and rather more than this number of last season's types still retained on the market, the prospective buyer must indeed be hard to please if he cannot find a type to suit his requirements with regard to performance, appearance and price.

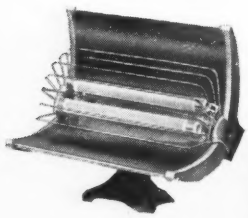
Due to their greater concentration of heat and apparent higher efficiency reflector fires still continue in favour, though there is still a big demand for the fire bar type, especially for situations where a concentration of heat is a disadvantage and even a possible source of danger, as for example in small rooms where the furniture is inevitably close to the fire.

Whatever type of fire is used, however, fire risks can nowadays be practically ignored, thanks to the guards which now have to be fitted as standard to conform to the new safety regulations. As might be expected these guards are being increasingly incorporated as an integral part of the fires rather than as an appendage.

Apart from the reduction in purchase tax, list prices of the more popular models are on the whole rather lower than last year: on the other hand some of the fires in the "luxury" ranges are somewhat more expensive. To-day one can pay anything between about £2 and £100 including purchase tax according to choice.

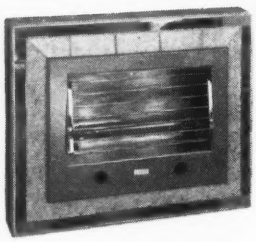
Manufacturer:	Arora Company			Bank Hardware Manufacturing Co., Ltd.			A. Bell & Co., Ltd.	
Name or model	410	375	410/2	EA.1	EV.1	EV.2	CF6	—
Type	Portable or wall mounting reflector	Portable reflector	Portable or wall mounting reflector	Portable	Portable	Portable	Portable reflector	Portable reflector
Elements	One 1 kW rod	Two 1 kW rod	Two 1 kW rod	One 750 W spiral	One 750 or 1,000 W spiral	Two 750 or 1,000 W spiral	Three 1 kW rod	Two 1 kW rod
Finish	Chrome and silver	Chrome and silver	Chrome andsilver	Coloured vitreous enamel	Coloured vitreous enamel	Coloured vitreous enamel	Chrome	Chrome
Price (excl. tax)	£2 16 0	£4 15 0	£4 10 0	No fixed retail selling prices			£20 0 0	£8 10 0
Purchase tax	£1 0 6	£1 14 10	£1 13 0				£6 10 0	£2 15 3

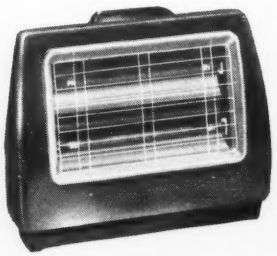
Manufacturer:	A. Bell & Co., Ltd. (*Continued*)			Belling & Co., Ltd.				
Name or model	—	399/50	399/51	"Hotspur"	"Dinkie"	"Empire"	"Solray"	"Dainty"
Type	Inset reflector	Wall panel	Wall panel	Portable reflector	Portable firebar	Portable firebar	Portable or wall	Portable firebar
Elements	Two 1 kW rod	Two 1 kW rod	One 1 kW rod	One or two 1 kW rod	One or two 1 kW bar	One, two or three 1 kW bar	One or two 1 kW rod	Two 1 kW bar
Finish	Chrome	Grey tiles with lustre strips and chromium reflector	Hand painted tiles with black border and chromium reflector	Silver, silver bronze, silver green	Silver, silver bronze, silver green	Beige or brown vitreous enamel	Cream & black	(*a*) Light bronze (*b*) Electro-plated bronze
Price (excl. tax)	£5 10 0	£10 15 0	£6 17 6	1 kW: £2 12 6 2 kW: £3 8 0	1 kW: £1 14 0 2 kW: £2 10 0	1 kW: £1 18 0 2 kW: £3 4 0 3 kW: £4 4 0	1 kW: £3 17 0 2 kW: £4 13 0	(*a*) £4 10 0 (*b*) £5 10 0
Purchase tax	£1 15 9	£3 9 11	£2 4 8	1 kW: £0 19 3 2 kW: £1 0 5	1 kW: £0 12 6 2 kW: £0 18 4	1 kW: £0 14 0 2 kW: £1 3 6 3 kW: £1 10 10	1 kW: £1 8 3 2 kW: £1 14 2	(*a*) £1 13 0 (*b*) £2 0 4



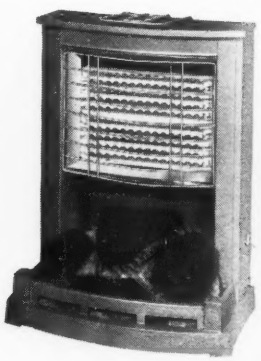
Arora 410/2 2 kW swivel reflector fire

Below: Bell 399/50 wall panel





Belling "Modern" and (right) Belling "Cheery"



Manufacturer:	**Belling** (*Continued*)							
Name or model	"County"	"Modern"	"Cheery"	"Adam"	"Sunset"	"Princess"	"Princess"	"Medieval"
Type	Portable reflector	Portable reflector	Imitation coal	Period	Illuminated reflector	Imitation coal	Imitation logs	Imitation fuel
Elements	Two or three 1 kW rod	Two 1 kW rod	Two 1 kW bar	Two or three 1 kW bar	Two 1 kW rod	Two or three 1 kW rod	Two or three 1 kW rod	Two 1 kW bar
Finish	Ripple silver, ripple bronze, ripple green	(*a*) Light bronze (*b*) Electro-plated bronze	Ripple silver or bronze	Bright antique	Oxidized copper	Bronze, silver green, ripple	Ripple bronze, silver or green	Antique
Price (excl. tax)	2 kW: £4 19 0 3 kW: £6 0 0	(*a*) £6 0 0 (*b*) £7 10 0	£7 0 0	2 kW: £8 10 0 3 kW: £9 18 0	£9 15 0	2 kW: £8 6 0 3 kW: £9 4 0	2 kW: £10 4 0 3 kW: £11 2 0	Coal: £11 10 0 Log: £13 10 0
Purchase tax	2 kW: £1 16 4 3 kW: £2 4 0	(*a*) £2 4 0 (*b*) £2 15 0	£2 11 4	2 kW: £3 2 5 3 kW: £3 12 8	£3 11 6	2 kW: £3 0 10 3 kW: £3 7 6	2 kW: £3 14 10 3 kW: £4 1 3	Coal: £4 4 4 Log: £4 19 0

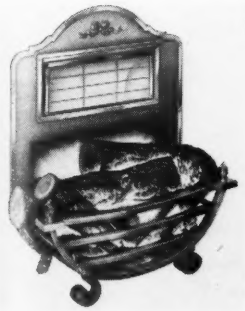
Manufacturer:	**Belling** (*Continued*)							
Name or model	"Waverley"	"Waverley"	"Melrose"	"Melrose"	"Converta"	"Hearth"	(C/1 & C/2)	F/2
Type	Imitation coal	Imitation coal	Illuminated	Illuminated	Fireplace screen	Imitation fuel	Firebar inset	Firebar inset
Elements	Three 1 kW bar or rod	Three 1 kW bar or rod	Three 1 kW bar or rod	Three 1 kW bar or rod	Two 1 kW bar or rod	Two 1 kW bar	One or two 1 kW bar	Two 1 kW bar
Finish	Beige	Electro-plated bronze	Beige	Electro-plated bronze	Ripple bronze	Bright antique	Electro-plated bronze	Electro-plated bronze
Price (excl. tax)	Bar: £15 8 0 Rod: £16 15 0	Bar: £19 0 0 Rod: £20 7 0	Bar: £13 5 0 Rod: £14 12 0	Bar: £16 7 6 Rod: £17 14 6	Bar: £6 0 0 Rod: £7 8 0	Coal: £7 9 0 Log: £9 7 0	1 kW: £2 0 0 2 kW: £3 0 0	£3 8 0
Purchase tax	Bar: £5 13 0 Rod: £6 2 10	Bar: £6 19 4 Rod: £7 9 3	Bar: £4 17 3 Rod: £5 7 1	Bar: £6 0 1 Rod: £6 10 0	Bar: £2 4 0 Rod: £2 14 4	Coal: £2 14 8 Log: £3 7 7	1 kW: £0 14 8 2 kW: £1 2 0	£1 5 0

Manufacturer:	**Belling** (*Continued*)					**Berry's Electric, Ltd.** (**"Magicoal"**)		
Name or model	G/2	Wall panel	"Homeguard"	"Celtic"	"Adam"	441 "Mayberry"	444 "Masterberry"	457 "Adjustaberry"
Type	Reflector inset	For C/1, C/2, F/2 & G/2	Safety reflector	Period log	Period coal	Reflector, imitation fuel	Reflector, imitation fuel	Radiant, imitation fuel
Elements	Two 1 kW rod	——	Two 1 kW rod	Three 1 kW	Three 1 kW	Two 1 kW rod	Four 500 W rod	Two 1¼ kW bar
Finish	Electro-plated bronze	Ripple bronze	Ripple silver, bronze, green	Antique	Antique	Warm silver	Warm silver	Armour bright
Price (excl. tax)	£4 7 6	£0 16 6	£7 13 0	£27 10 0	£26 5 0	£11 17 6	£14 7 6	£11 15 6
Purchase tax	£1 12 1	£0 6 1	£2 16 1	£10 1 9	£9 12 6	£4 6 10	£5 5 1	£4 6 1

Manufacturer:	**Berry's Electric, Ltd.** (**"Magicoal"**) (*Continued*)							
Name or model	A.21/S"Berrylog"	A.21/O"Berrylog"	108"Emberberry"	109"Emberberry"	406"Woodberry"	628 "Vanguard"	442 "Homeberry"	630 "Beryl"
Type	Radiant, imitation fuel. Straight legs	Radiant, imitation fuel. Rosette dogs	Radiant, imitation fuel	Radiant, imitation fuel. With dogs	Radiant, imitation fuel	Reflector	Reflector, imitation fuel	Portable reflector
Elements	One 1¼ kW bar	One 1¼ kW bar	One 2 kW bar	One 2 kW bar	Two 1¼ kW bar	Two 1 kW rod	Two 1 kW rod	One 1 kW rod
Finish	Satin antique	Satin antique	Armour bright	Armour bright	Armour bright	Cream	Warm silver	Warm silver
Price (excl. tax)	£9 18 6	£10 12 6	£16 2 6	£18 8 6	£15 2 6	£5 15 6 With safety switch: £6 15 6	£9 7 6	£2 14 0
Purchase tax	£3 12 7	£3 17 8	£5 17 11	£6 14 9	£5 10 7	£2 2 3 With safety switch: £2 9 7	£3 8 6	£0 19 9

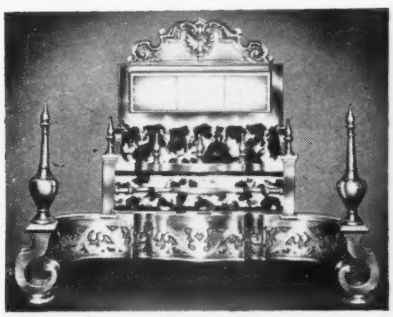
Manufacturer:	**Berry's** (*Continued*)	
Name or model	40 "Fleur-de-Lis"	"Jacobean 5"
Type	Concealed radiant, imitation fuel	Concealed radiant, imitation fuel
Elements	Two 1¼ kW bar	Two 1¼ kW bar
Finish	Armour bright	Armour bright
Price (excl. tax)	£34 17 6	£27 10 0
Purchase tax	£13 12 0	£10 14 6

Manufacturer:	**Berry's** (*Continued*)	
Name or model	"Jacobean 14"	42 "Wilton"
Type	Concealed radiant, imitation fuel	Concealed radiant, imitation fuel
Elements	Two 1¼ kW bar	Two 1¼ kW bar
Finish	Armour bright	Antique bright, rustless
Price (excl. tax)	£30 17 6	£69 0 0
Purchase tax	£12 0 10	£26 18 2



Berry's "Alderberry"

Berry's "Wilton"



FIRES . . . . . *continued*

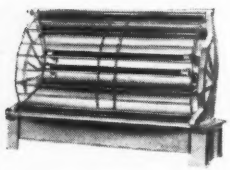
Manufacturer:	Berry's Electric, Ltd. *(Continued)*				Bescol (Electric), Ltd.	Bratt, Colbran, Ltd. ("Solectra")	
Name or model	110 "Alderberry"	11" Queen Anne"	2 "Georgian"	8 "Adam Shell"	"Swallow"	204	252
Type	Concealed radiant, imitation fuel	Concealed radiant, imitation fuel	Concealed radiant, imitation fuel	Concealed radiant, imitation fuel	Portable reflector	Outset	Outset
Elements	Two 1 kW bar	Two 1½ kW bar	Two 1½ kW bar	Two 1½ kW bar	Two 1 kW rod	One 1 kW rod	Two 1 kW rod
Finish	Armour bright	Antique bright, rustless	Antique bright, rustless	Antique bright, rustless	Chromium with cream stand	Lustral beige	Lustral beige
Price (excl. tax)	£19 10 0	£47 16 6	£37 17 6	£43 17 6	£2 16 0	£3 16 0	£5 3 6
Purchase tax	£7 2 7	£18 13 0	£14 15 5	£17 2 3	£1 0 6	£1 7 9	£1 17 11

Manufacturer:	Bratt, Colbran *(Continued)*				British National Electrics, Ltd.			
Name or model	251	227 "Sunrise"	253	272	F.101	F.102	F.103	F.104
Type	Inset	Imitation fuel	Portable	Dual purpose, portable and overhead	Portable refractory bar	Portable refractory bar	Portable reflector	Portable reflector
Elements	Two 1 kW rod	Three 833W rod	Two 1 kW rod	1 kW	One 1 kW bar	Two 1 kW bar	Two 1 kW rod	One 1 kW rod
Finish	Chrome	Chrome	Black/chrome	Gold lustre	Florentine bronze	Florentine bronze	Black & ivory enamel	Chocolate & ivory enamel
Price (excl. tax)	£3 16 0	£14 3 6	£4 16 9	£3 0 0	£2 0 0	£2 17 6	£5 15 0	£2 10 0
Purchase tax	£1 7 9	£5 3 8	£1 15 5	£1 2 0	£0 14 8	£1 1' 1	£2 2 1	£0 18 4

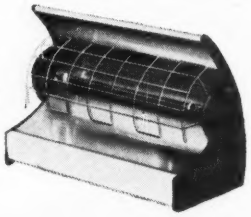
Manufacturer:	Bulpitt & Sons, Ltd. ("Swan Brand")			Carron Company				C.W.S.
Name or model	820 "Waldorf"	831"Woodstock"	832"Woodstock"	"Sirus"	"Beaconette" and "Curtsey"	Pedestal	"Sunglo"	"Windsor"
Type	Portable reflector	Portable reflector	Portable reflector	Portable firebar	Portable reflector	Portable reflector	Portable reflector	Portable reflector
Elements	One 1 kW rod	One 1 kW rod	Two 1 kW rod	One or two 1 kW	One or two 1 kW	One or two 1 kW	Two 1,250 W	One or two 1 kW
Finish	Stove enamel	Stove enamel	Stove enamel	Vitreous enamel	Carrontine	Art silver	Chromium	Vitreous enamel
Price (excl. tax)	£2 2 0	£4 0 0	£6 2 6	1 kW: £1 16 6 2 kW: £2 19 6	1 kW: £1 19 9 2 kW: £2 19 6	1 kW: £2 15 6 2 kW: £3 15 6	£8 2 3	1 kW: £3 0 0 2 kW: £5 0 0
Purchase tax	£0 15 4	£1 9 3	£2 4 9	1 kW: £0 13 4 2 kW: £1 1 9	1 kW: £0 14 6 2 kW: £1 1 9	1 kW: £1 0 4 2 kW: £1 7 7	£2 19 4	1 kW: £1 2 6 2 kW: £1 17 6

Manufacturer:	Co-operative Wholesale Society *(Continued)*			Cranmer & Cheshire, Ltd. ("Nichro")				
Name or model	"Ascot"	"Eden"	"Avon"	No. 422	No. 424	Nos. 426 & 429	No. 430	No. 438
Type	Portable or wall mounting parabolic	Portable	Portable	Portable tilting reflector	Portable double tilting reflector	Wall fixing (bathroom)	Portable tilting reflector	Portable rigid reflector with glow lamp behind grille
Elements	One 1 kW rod	1 kW or 2 kW bar	1 kW or 2 kW bar	One or two 1 kW rod	Two 1 kW rod	No. 426: One 1 kW rod No. 429: One 750 W rod	One or two 750 W rod	Two 1 kW rod
Finish	"Dimenso" stove enamel	"Dimenso" stove enamel	"Dimenso" stove enamel	Silver grey	Silver grey	Silver grey	Silver grey	Silver grey
Price (excl. tax)	£1 16 9	1 kW: £1 16 9 2 kW: £2 12 9	1 kW: £1 9 6 2 kW: £2 3 9	1 kW: £3 2 3 2 kW: £3 17 9	£5 5 0	No. 426: £3 4 0 No. 429: £3 0 6	750 W: £2 17 0 1,500 W: £3 11 0	£5 9 0
Purchase tax	£0 13 9	1 kW: £0 13 9 2 kW: £0 19 9	1 kW: £0 11 0 2 kW: £0 16 5	1 kW: £1 2 9 2 kW: £1 8 5	£1 18 4	No. 426: £1 3 5 No. 429: £1 2 2	750 W: £1 0 10 1,500 W: £1 6 0	£1 19 10

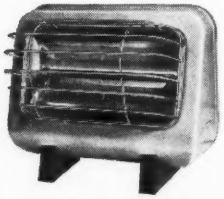
Manufacturer:	Crosslands (Rugeley), Ltd.		Dexray Engineering Co., Ltd.				Dowsing Co. (Elecl. Mfrs.) Ltd.	
Name or model	"Raydant" 800	700	R.10	R.15	R.21	R.25	N.102	N.112
Type	Portable reflector	Portable bar	Portable ornamental wrought iron	Wall mounting (bathroom)	Portable reflector, radiator-convector	Portable or inset mirror, panelled reflector	Portable reflector	Portable reflector
Elements	One or two 1 kW rod	One or two 1 kW bar	Two 1 kW rod	One 1 kW rod	One or two 1 kW rod	Two 1 kW rod	One 750 W rod	One 1 kW rod
Finish	Cream stove enamel frame, chromium reflector	Hammered gold	Cream & gold	Cream & black	Bronze and chromium	Silver mirror and chromium	Cream enamel	Cream enamel
Price (excl. tax)	1 kW: £2 7 6 2 kW: £3 4 2	Not yet fixed	£6 5 0	£3 10 0	1 kW: £3 7 6 2 kW: £3 18 0	£13 6 8	£2 3 10	£2 18 2
Purchase tax	1 kW: £0 17 2 2 kW: £1 3 2	—	£2 6 10	£1 6 3	1 kW: £1 5 4 2 kW: £1 9 3	£5 0 0	£0 16 0	£1 1 4



Left: Crosslands 2 kW "Raydant"



Left: B.N.E. F.104



Left: Bulpitt 820 "Waldorf"

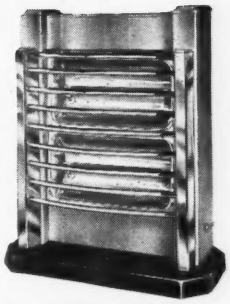
Manufacturer:	Dowsing Co. (Electrical Manufacturers), Ltd. (*Continued*)		E.R. Company
Name or model	N.121 & N.131	N.151	—
Type	Portable reflector	Portable reflector	Copper and aluminium bowl
Elements	N.121: One 1 kW rod. N.131: Two 1 kW rod	Two 1 kW rod	500 W
Finish	Cream enamel	Cream enamel	Black
Price (excl. tax)	N.121: £3 15 6 N.131: £4 16 7	£5 8 2	On application
Purchase tax	N.121: £1 7 8 N.131: £1 15 4	£1 19 7	—

Manufacturer:	E.R. Company (*Continued*)	Electroway Heaters, Ltd.	
Name or model	—	—	—
Type	Aluminium reflector	8 types portable panel bar or reflector	13 types wall panel bar or reflector
Elements	750 W or 1,000 W rod	One or two 1 kW bar or rod	One, two or three 1 kW bar or rod
Finish	Green	Stove enamel	Stove enamel or chromium
Price (excl. tax)	On application	£1 6 6 to £6 10 0	£2 7 9 to £6 3 6
Purchase tax	—	£0 9 9 to £2 7 8	£0 17 6 to £2 5 4

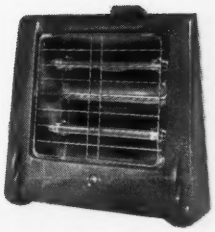
Manufacturer:	Electroway Heaters (*Continued*)	Falco Electrical Appliances, Ltd.	
Name or model	—	E.F.40	E.F.35
Type	19 types inset panel bar or reflector	Portable reflector	Portable reflector
Elements	One, two or three 1 kW bar or rod	One 1 kW rod	Two 1 kW rod
Finish	Stove enamel or chromium	Cream enamel	Stove enamel, varjous shades
Price (excl. tax)	£1 14 3 to £6 3 0	£2 10 6	£5 10 0
Purchase tax	£0 12 7 to £2 5 2	£0 18 6	£2 0 3

Manufacturer:	Falk, Stadelmann & Co., Ltd. (" Falks ")		
Name or model	95655/6 " Economist "	95691/2 " Sunray "	95670 Bathroom
Type	Portable reflector	Reflector	Wall mounting reflector
Elements	One or two 1 kW rod	One or two 1 kW rod	One 1 kW rod
Finish	Cream enamel die-cast frame, black enamel die-cast feet	Cream enamel die-cast sides, chrome reflector	Cream enamel die-cast frame, black enamel die-cast feet
Price (excl. tax)	1 kW: £2 15 0 2 kW: £3 15 0	1 kW: £3 8 3 2 kW: £4 7 0	£3 5 0
Purchase tax	1 kW: £1 0 2 2 kW: £1 7 6	1 kW: £1 4 11 2 kW: £1 11 10	£1 3 10

Manufacturer:	Falk, Stadelmann & Co., Ltd. (" Falks ") (*Continued*)		Ferranti, Ltd.
Name or model	95664	95708/9 " Olympian "	P33132
Type	Portable reflector	Reflector	Panel reflector
Elements	One 600 W	One or two 1 kW rod	Two 1 kW rod
Finish	Cream or hammered grey enamel, cast iron base, reflector with grid guard	Hammered bronze sheet metal frame polished aluminium reflector	Clear polished
Price (excl. tax)	£1 5 0	1 kW: £2 10 0 2 kW: £3 5 0	£16 2 6
Purchase tax	£0 9 2	1 kW: £0 18 4 2 kW: £1 3 10	£5 18 0

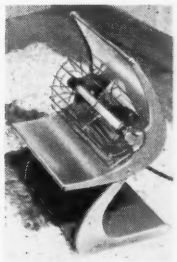


Bulpitt 832 " Woodstock "



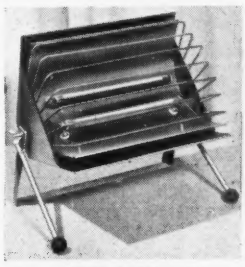
C.W.S. 2 kW " Windsor "

Bratt, Colbran No. 227 " Sunrise "

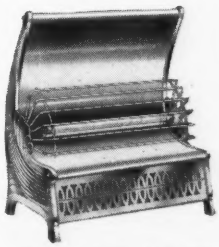


Bratt, Colbran No. 272 dual purpose heater

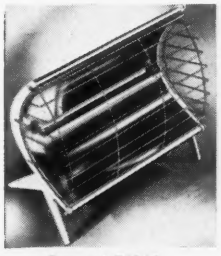
C.W.S. " Ascot "



Dexray R.21 2 kW radiator-convector

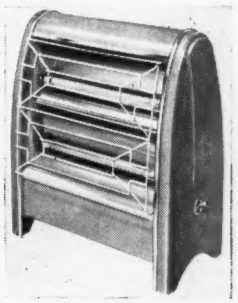


Cranmer & Cheshire 438



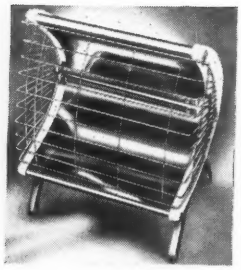
Ferranti F4144

Falk, Stadelmann bowl fire 95664

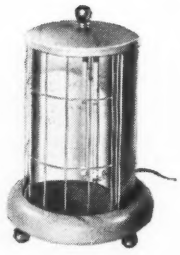


Falk, Stadelmann reflector fire

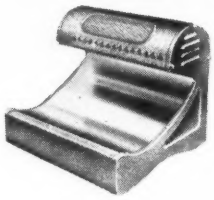
FIRES . . . . . *continued*



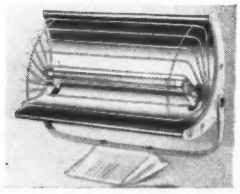
Above: Ferranti F4140

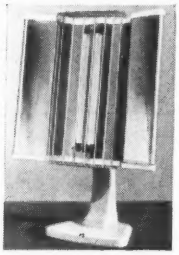


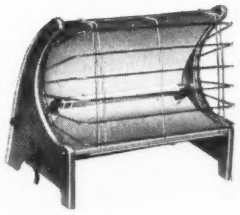
Above right: W. T. French "Linnet"



Right: W. T. French "Mysto Vector"







Above: Gatehill "Richmond" 1 kW fire

Above left: G.E.C. D2767

Left: G.E.C. D2812

Manufacturer:	Ferranti, Ltd. (*Continued*)							
Name or model	P3310	W2781	F3090	F3096	F3111	F3117	F3102	F3108
Type	Panel reflector	Wall reflector	Floor reflector	Floor reflector	Floor reflector	Floor refl'or.illum.	Floor reflector	Floor reflector
Elements	Two 1,250 W rod	One 1 kW rod	One 750 or 1,000 W rod	Two 750 or 1,000 W rod	Two 1,250 W rod	Two 1,250 W rod	Two 750 or 1,000 W rod	Two 1 kW or 1,250 W rod
Finish	Clear polished	White or silver, with clear polished reflector	Silver with clear polished reflector. Copper or cream with solium reflector		Silver with clear polished reflector. Copper with solium reflector		Cream with clear polished or solium reflector	Cream with clear polished or solium reflector
Price (excl. tax)	£24 10 6	£5 19 0	£3 4 6	£5 0 0	£10 17 6	£12 5 0	£7 10 0	£8 8 0
Purchase tax	£8 19 5	£1 8 10	£1 3 7	£1 16 7	£3 19 6	£4 9 7	£2 14 10	£3 1 5

Manufacturer:	Ferranti, Ltd. (*Continued*)					W. T. French & Son, Ltd. ("Mysto")		
Name or model	FS7250	F3123	P33122	F4140	F4144	No. 1202	"Major" No. 1271/2	"Countess" No. 1003
Type	Floor reflector	Reflector, available as floor, inset or outset	Panel reflector	Floor reflector	Floor reflector	Portable reflector (adjustable)	Portable firebar	Portable reflector
Elements	One 1,250 W rod	Two 1 kW rod	Two 750 W rod	Two 1 kW rod	One 1 kW rod	One 750 W rod	One or two 1 kW bar	Two 1 kW rod
Finish	"Ambronze" with clear polished reflector	Cream with clear polished reflector	Clear polished	Cream with clear polished or solium reflector	Cream with clear polished reflector	Green, beige or metallic blue	Beige, green, hammered silver or hammered gold	Gold, metallic blue, hammered silver or hammered gold
Price (excl. tax)	£8 0 0	£10 3 6	£12 10 0	£6 10 6	£2 13 4	£1 13 6	1 kW: £1 7 6 2 kW: £2 7 6	£8 2 6
Purchase tax	£2 18 6	£3 14 5	£4 11 5	£2 7 6	£0 19 6	£0 12 4	1 kW: £0 10 1 2 kW: £0 17 6	£2 19 10

Manufacturer:	W. T. French (*Continued*)			H. Frost & Co., Ltd. ("Sunhouse")			G.B.M. (Elecl.), Birmingham, Ltd.	
Name or model	No. 1130 "Linnet"	No. 1127 "Mysto Vector"	No. 1002 Bowl	—	—	—	R.F.1	R.F.2
Type	Portable reflector	Portable reflector	Portable	Inset, reflector and flat bar	Outset wall panel, reflector and flat bar	Portable, reflector and flat bar	Portable corrugated chromium refl'or	Portable corrugated chromium refl'or
Elements	2 kW	1 kW	600 W	One or two 1 or 1½ kW rod, 1 kW flat bar	One or two 1 or 1½ kW rod, 1 kW flat bar	One or two 1 kW rod, 1 kW flat bar	One 1 kW rod	Two 1 kW rod
Finish	Hammered gold, silver or metallic finish	Hammered gold or silver	Green, bronze, metallic blue	Stove enamel or chromium	Stove enamel	Stove enamel and chromium	Cream with gold relief	Cream with gold relief
Price (excl. tax)	£3 7 0	£3 19 8	Aluminium: £1 5 0 Copper: £1 7 6 Chromium: £1 9 6	£1 15 10 to £6 17 6	£2 0 7 to £8 19 2	£1 13 9 to £4 11 8	£1 19 2	£2 19 2
Purchase tax	£1 13 6	£1 19 10	Aluminium: £0 9 2 Copper: £0 10 0 Chromium: £0 11 0	£0 13 2 to £2 10 6	£0 14 11 to £3 5 10	£0 12 5 to £1 13 9	£0 14 4	£1 1 8

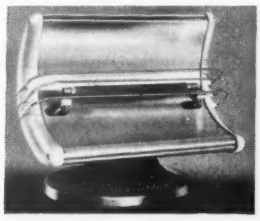
Manufacturer:	Gatehill Manufacturing Co., Ltd.	General Electric Co., Ltd.						
Name or model	Richmond	D2811G	D2852G	DH2406G	D2342G	D2496G & D2497G	D2391G	D2392G
Type	Portable reflector	Dispersive multi-parabola reflector	Dispersive multi-parabola inset reflector	Slot meter reflector	Portable cast-iron firebar	Portable sheet-metal panel	Inset wall	Inset wall
Elements	One or two 1 kW rod	Two 1 kW rod	Two 1 kW rod	One or two 1 kW	Two 1 kW bar	One or two 1 kW bar	One 1 kW bar	Two 1 kW bar
Finish	Gold hammer	Bronze, cream or green	Bronze or chromium	Bronze	Beige or green	Beige, cream or green	Bronze or chromium	Bronze or chromium
Price (excl. tax)	1 kW: £1 4 2 2 kW: £1 17 6	£5 10 0	Bronze: £5 6 0 Chromium: £5 18 0	£22 15 0	£3 14 6	1 kW: £1 15 6 2 kW: £2 12 6	Bronze: £2 2 0 Chromium: £2 16 0 (Surround: £1 10 0)	Bronze: £3 6 0 Chromium: £4 0 0 (Surround: £1 10 0)
Purchase tax	1 kW: £0 9 0 2 kW: £0 14 0	£2 0 3	Bronze: £1 18 9 Chromium: £2 3 2	£9 8 6	£1 7 3	1 kW: £0 13 0 2 kW: £0 19 2	Bronze: £0 15 4 Chromium: £1 0 6 (Surround: £0 11 0)	Bronze: £1 4 2 Chromium: £1 9 3 (Surround: £0 11 0)

ufacturer:	General Electric Co., Ltd. (Continued)							
e or model	D2394G & D2395G	D2757	D2766	D2767	D2773	D2774	D2812 "Cosyglo"	D2853 "Cosyglo"
e	Cast-iron surface-mounting wall	Pedestal heater	Portable or wall mounting reflector	Portable or wall mounting reflector	Portable reflector	Portable reflector	Portable multi-parabola reflector	Wall multi-parabola reflector
ments	One or two 1 kW bar	One 750 W	One 1 kW rod	Two 1 kW rod	One 1 kW rod	Two 1 kW rod	Two 1 kW rod	Two 1 kW rod
ish	Beige vitreous enamel	Cream	Cream	Cream	Cream or silver-bronze	Cream or silver-bronze	Cream or silver-bronze	Cream
e (excl. tax)	1 kW: £3 6 6 2 kW: £4 8 0	£1 16 6	£3 2 6	£4 0 0	£2 12 6	£3 10 0	£4 15 0	£5 15 0
chase tax	1 kW: £1 4 4 2 kW: £1 12 2	£0 13 4	£1 2 10	£1 9 3	£0 19 2	£1 5 7	£1 14 9	£2 2 1

Manufacturer:	Grafton Heater Co.		Grubb Engineering Co., Ltd.		H.M.V. Household Appliances		L. G. Hawkins & Co., Ltd.	
Name or model	No. 9	106/36	—	—	"Portman"	"Welbeck"	LGH32 "Glory"	LGH33 "Glory"
Type	Reflector	Bowl	Portable	Portable	Portable reflector	Portable adjustable reflector	Reflector	Reflector
Elements	Two 1 kW rod	600 W e.s.	2 kW	1 kW	One or two 1 kW rod	One or two 1 kW rod	One 1 kW rod	Two 2 kW rod
Finish	Cream enamel	Various colours	Range of colours	Range of colours	Chromium with beige and red	Chromium with beige and red	Green, ivory, mushroom	Green, ivory, mushroom
Price (excl. tax)	£3 0 0	£1 10 0	£3 7 6	£2 17 6	1 kW: £3 2 6 2 kW: £4 2 6	1 kW: £3 12 6 2 kW: £4 12 6	£2 10 10	£3 12 9
Purchase tax	£1 2 6	£0 11 3	£1 4 8	£1 1 0	1 kW: £1 2 10 2 kW: £1 10 2	1 kW: £1 6 6 2 kW: £1 13 10	£0 18 8	£1 6 9

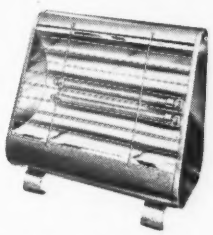
Manufacturer:	L. G. Hawkins & Co., Ltd. (Cont.)	
Name or model	"Sunray" LGH444	Pixie
Type	Reflector	Reflector
Elements	1,500 W rod	750 W or 1 kW rod
Finish	Sprayed bronze	Green, ivory and mushroom
Price (excl. tax)	£5 3 6	£1 18 7
Purchase tax	£1 18 0	£0 14 2

Manufacturer:	Heatrae, Ltd.	
Name or model	4332 "Dandy"	4431 "Pilot"
Type	Portable reflector	Portable reflector
Elements	Two 1 kW rod	One 1 kW rod
Finish	Ivory tan	Ivory tan
Price (excl. tax)	£6 10 0	£3 11 6
Purchase tax	£2 7 7	£1 6 2

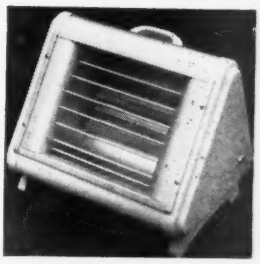


H.M.V. "Welbeck"

Hotpoint 1 kW model HF151



L. G. Hawkins 2 kW "Glory"



Heatrae "Dandy" 2 kW

FIRES . . . . . *continued*

Manufacturer:	Hotpoint Electric Appliance Co.				C. Hounslow & Co., Ltd. ("Chalex")			
Name or model	HF151	HF152	30C	93	3001	3002	3001	3002
Type	Portable reflector	Portable reflector	Portable bowl	Portable bar	Portable bar	Portable bar	Portable bar	Portable bar
Elements	One 1 kW rod	Two 1 kW rod	600 W or 750 W	Two 1 kW bar	1 kW	2 kW	1 kW	2 kW
Finish	Chromium plated brass reflector, cream stove enamelled end castings		Chromium plated copper bowl on black enamel base	Mottled cream vitreous enamel	Beige stove enamel	Beige stove enamel	Bronze	Bronze
Price (excl. tax)	£2 15 0	£3 10 0	£2 5 0	£4 0 0	£1 10 11	£2 12 6	£1 10 11	£2 12 6
Purchase tax	£1 0 2	£1 5 7	£0 16 5	£1 7 3	£0 11 4	£0 19 3	£0 11 4	£0 19 3

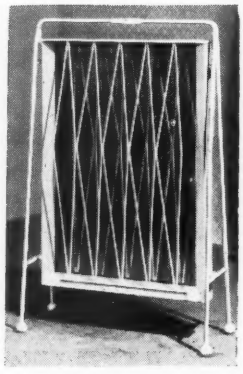
Manufacturer:	I.R.L. Products	Kego Electric Co.	Midland Electric Manufacturing Co., Ltd.					Monarch Electric, Ltd.
Name or model	"Dudley"	F100	"Mayfair"	"Walbeam"	"Memray"	"Reflex"	"Walray"	500
Type	Portable reflector	Reflector bowl on wood stand	Portable radiant	Wall mounting (outset)	Portable reflector (adjustable)	Portable reflector (fixed)	Wall mounting (inset)	Portable
Elements	One 1 kW rod	One 600 W	One or two 1 kW panel	One or two 1 kW panel	One or two 1 kW rod	One or two 1 kW rod	Two 1 kW rod	One 750 W bar
Finish	Hammered gold or green, with chromium reflector	Polished copper	Choice	Choice	Choice	Choice	Choice	Stove enamel, various colours
Price (excl. tax)	On application	On application	1 kW: £2 2 0 2 kW: £3 4 0	1 kW: £2 16 0 2 kW: £4 10 0	1 kW: £2 15 0 2 kW: £4 1 0	1 kW: £2 8 0 2 kW: £3 12 0	£5 6 0	£1 6 0
Purchase tax	—		1 kW: £0 15 4 2 kW: £1 3 5	1 kW: £1 0 6 2 kW: £1 12 11	1 kW: £1 0 1 2 kW: £1 9 7	1 kW: £0 17 7 2 kW: £1 6 4	£1 18 9	£0 9 9

Manufacturer:	Monarch Electric, Ltd. (*Continued*)		T. B. Morley & Co., Ltd. ("Morco")					
Name or model	501	502	"Thames"	"Severn"	Morco "Bowl"	"Derwent"	"Don"	"Homber"
Type	Portable	Portable	Polished reflector	Portable, flat bar	Portable bowl	Portable reflector	Portable reflector	Portable reflector
Elements	One 1 kW bar	Two 1 kW bar	One or two 750 W rod	One or two 1 kW rod	600 W	One or two 1 kW rod	One or two 750 W or 1 kW rod	One or two 750 W rod
Finish	Stove enamel, various colours	Stove enamel, various colours	Sprayed	Sprayed	Sprayed	Sprayed	Sprayed cream	Sprayed cream
Price (excl. tax)	£1 9 0	£2 8 0	750W: £1 11 0 1500W: £2 7 0	1 kW: £1 10 0 2 kW: £2 5 0	£1 8 6	1 kW: £2 9 0 2 kW: £3 2 0	750W: £2 8 0 1 kW: £2 11 0 1½ kW: £2 18 0 2 kW: £3 4 0	750W: £2 8 0 1500W: £2 18 0
Purchase tax	£0 10 10½	£0 18 0	750W: £0 11 5 1500W: £0 17 3	1 kW: £0 11 0 2 kW: £0 16 6	£0 10 6	1 kW: £0 18 0 2 kW: £1 2 9	750W: £0 17 7 1 kW: £0 18 8 1½ kW: £1 1 3 2 kW: £1 3 6	750W: £0 17 8 1500W: £1 1 4

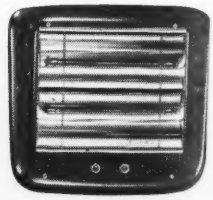
Manufacturer:	T. B. Morley Co. (*Continued*)	Morphy-Richards, Ltd.						Premier Electric Heaters, Ltd.
Name or model	"Aire"	"Cray" FC/750	"Cray" FC/15	"Cray" FC/10	"Cray" FC/20	"Avon" FA/10	"Avon" FA/20	"Paraglow"
Type	Portable reflector	Portable reflector	Portable reflector	Portable reflector	Portable reflector	Portable reflector	Portable reflector	Portable reflector
Elements	One or two 1 kW rod	One 750 W rod	Two 750 W rod	One 1 kW rod	Two 1 kW rod	One 1 kW rod	Two 1 kW rod	One or two 1 kW rod
Finish	Sprayed cream	Beige	Beige	Beige	Beige	Beige	Beige	Cream or bronze
Price (excl. tax)	1 kW: £2 9 0 2 kW: £3 2 0	£1 19 6	£2 12 6	£2 5 0	£2 15 0	£3 10 0	£4 5 0	1 kW: £2 5 0 2 kW: £2 15 0
Purchase tax	1 kW: £0 18 0 2 kW: £1 2 9	£0 14 5	£0 19 3	£0 16 6	£1 0 2	£1 5 7	£1 11 1	1 kW: £0 16 5 2 kW: £1 0 1

Manufacturer:	Premier Electric Heaters, Ltd. (*Continued*)			
Name or model	"Jewel"	"Parabain"	"Parabeau"	"Parabon"
Type	Portable reflector	Bathroom or kitchen reflector	Portable reflector	Portable reflector
Elements	One 1 kW rod	One 1 kW rod	Two 1 kW rod	One 1 kW rod
Finish	Cream or green	Ivory	Gilt	Pastel cream
Price (excl. tax)	£1 17 6	£3 9 6	£4 19 6	£2 10 0
Purchase tax	£0 13 9	£1 5 5	£1 16 4	£0 18 3

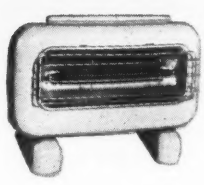
Manufacturer:	Premier Electric Heaters, Ltd. (*Continued*)			
Name or model	"Paravic"	"Guardian"	"Carlton"	Screen heater
Type	Portable reflector	Portable reflector	Reflector	Radiant heater glass
Elements	Two 1 kW rod	Two 1 kW rod	Two 1 kW rod	1 kW
Finish	Sprayed silver	Bronze	Gold, silver or copper	Cream and white
Price (excl. tax)	£3 15 0	£6 0 0	£12 0 0	£9 10 0
Purchase tax	£1 7 5	£2 3 10	£4 7 9	£3 9 5

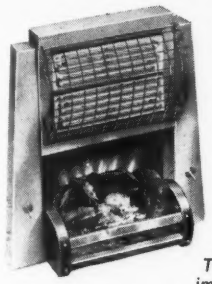


Premier screen heater and (right) Premier "Jewel"

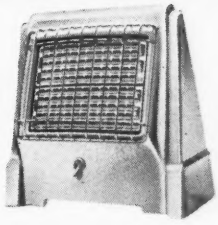


M.E.M. "Walray"

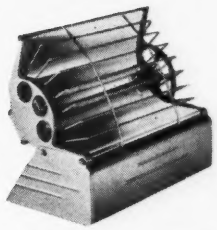




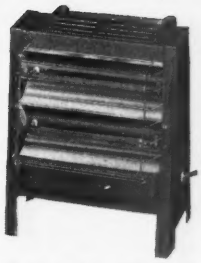
Telsen 1175 imitation coal fire



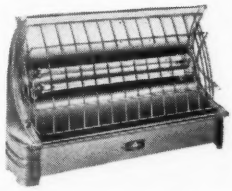
Revo "Dolphin"



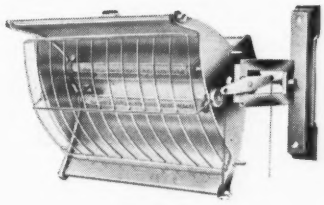
Reeves 2 kW "Wizard"



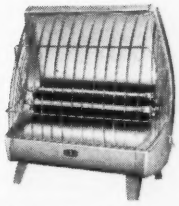
T. B. Morley "Thames"



Morphy-Richards FC/20 "Cray"



Revo "Reflexam"



Morphy-Richards FA/20 "Avon"

Manufacturer :	Reeves Electrical & Radio Co., Ltd.						Revo Electric Co., Ltd.	
Name or model	"Popular"	"Minor"	"Handy"	"Wizard"	"Adjustable"	"Screen"	"Reflexam"	"Dolphin"
Type	Portable reflector (steel)	Portable reflector (cast aluminium ends)	Portable reflector (sheet steel)	Portable reflector (cast aluminium ends and sheet steel)	Portable adjustable reflector (cast aluminium ends, steel base)	Portable screen reflector (steel)	Wall mounting adjust. reflector	Portable firebar
Elements	One or two 750 W rod	One 1 kW	One or two 1 kW rod	One or two 1 kW rod	One or two 1 kW rod	One 750 W rod	One or two 1 kW rod	Two 1 kW firebar
Finish	Cream, beige, blue, green	Cream, beige, blue, green	Beige, blue, green	Cream, beige, blue, green	Cream, beige, green, blue	Cream, beige, green, blue	Chromium plated & artshade silver	Beige vitreous enamel
Price (excl. tax)	750W: £1 0 0 1500W: £1 15 0	£1 12 0	1 kW: £1 10 0 2 kW: £2 5 0	1 kW: £2 0 0 2 kW: £2 10 0	1 kW: £2 5 0 2 kW: £2 15 0	£1 7 6	1 kW: £3 2 6 2 kW: £4 5 0	£3 13 6
Purchase tax	750W: £0 7 4 1500W: £0 12 9	£0 11 9	1 kW: £0 11 0 2 kW: £0 16 5	1 kW: £0 14 8 2 kW: £0 18 4	1 kW: £0 16 5 2 kW: £1 0 2	£0 10 1	1 kW: £1 2 11 2 kW: £1 11 1	£1 6 11

Manufacturer:	Revo Electric Co. (*Continued*)			Sperryn & Co., Ltd.				
Name or model	"Revo-Inset"	"Revo-Outset"	"Tubula"	—	—	F4082/3	F801	—
Type	Inset with slabbing frame	Outset	Portable reflector	Portable	Portable	Portable screen	Bathroom	Wall panel
Elements	One or two 1kW rod or firebar	Two 1 kW rod or firebar	One or two 1 kW rod	One or two 1 kW bar	One or two 1 kW rod	Two 1 kW rod	One 1 kW rod	One or two 1 kW bar or rod
Finish	Polished aluminium	Artshade bronze & polished aluminium	Chromium plated & artshade silver	Pastel green & beige vitreous enamel	Pastel green & beige vit.enamel also oxy. silver	Pastel green & cream vitreous enamel	Chromium	Pastel green & cream vitreous enamel
Price (excl. tax)	1 kW: £1 16 0 2 kW: £2 19 0	£3 10 0	1 kW: £2 17 6 2 kW: £3 17 0	£2 7 4 to £4 2 4	£2 9 8 to £4 15 4	£6 12 0	£3 6 8	£2 14 0 to £4 8 0
Purchase tax	1 kW: £0 13 2 2 kW: £1 1 7	£1 5 7	1 kW: £1 1 1 2 kW: £1 8 2	£0 17 6 to £1 10 3	£0 18 3 to £1 15 0	£2 8 6	£1 4 6	£0 19 10 to £1 12 4

Manufacturer:	Sperryn & Co. (*Continued*)	Telsen Electric Co. (1935), Ltd.						
Name or model	—	1200	1205	1210	1215	1160	1170	1175
Type	Inset	Portable reflector	Portable reflector	Pedestal reflector	Pedestal reflector	Cast iron fire bar	Cast iron fire bar	Imitation coal fire
Elements	One or two 1 kW bar or rod	1 kW rod	Two 1 kW rod	One 1 kW rod	Two 1 kW rod	One 1 kW bar	Two 1 kW bar	Two 1 kW bar
Finish	Pastel green & cream vitreous enamel	Vitreous enamel and chrome	Vitreous enamel and chrome	Vitreous enamel and chrome	Vitreous enamel and chrome	Vitreous enamel	Vitreous enamel	Gold bronze enamel
Price (excl. tax)	£2 8 0 to £4 7 8	£1 10 0	£2 10 0	£1 15 0	£2 15 0	£1 18 6	£3 15 0	£6 5 0
Purchase tax	£0 17 8 to £1 12 3	£0 11 3	£0 18 9	£0 13 1½	£1 1 9	£0 14 5½	£1 0 7½	£2 6 10½

FIRES . . . . . *continued*

Manufacturer:	Telsen (*Continued*)	Tym's Electric ("Systym")		
Name or model	1500	"Sunglo"	"Sunshine"	"Contemporary"
Type	Bathroom	Portable	Portable	Bowl
Elements	750 W rod	One 750 W bar	One or two 750 W bar	One 650 W
Finish	Black and chromium	Various sprayed	Various sprayed	Polished aluminium
Price (excl. tax)	£2 2 0	£0 18 9	750 W: £1 4 6 1500 W: £1 13 6	£0 19 9
Purchase tax	£0 15 9	£0 5 6	750 W: £0 7 7 1500 W: £0 11 0	£0 6 0

LIST OF MANUFACTURERS

Arora Co., 67, Rosebery Street, Loughborough.
Bank Hardware Manufacturing Co., Ltd., Pleck Road, Walsall.
Bell, A., & Co., Ltd., 1a & 3, Gold Street, Northampton.
Belling & Co., Ltd., Bridge Works, Southbury Road, Enfield.
Berry's Electric, Ltd., Touchbutton House, Newman Street, London, W.1.
Bescol (Electric), Ltd., 118, Parkfield Road, Saltley, Birmingham, 8.
Bratt Colbran, Ltd., 10, Mortimer Street, London, W.1.
British National Electrics, Ltd., Newarthill, Motherwell, Lanarkshire.
Bulpitt & Sons, Ltd., Icknield Street, Birmingham, 18.
Carron Company, Carron, Falkirk.
Co-operative Wholesale Society, National Works, Hall Street, Dudley, Worcs.
Cranmer & Cheshire, Ltd., 7-9, Steward Street, Birmingham, 18.
Crosslands (Rugeley), Ltd., 55, Ebury Street, London, S.W.1.
Dexray Engineering Co., Ltd., 34, Ardwick Green South, Manchester, 13.
Dowsing Co. (Electrical Manufacturers), Ltd., Kangley Bridge Road, Lower Sydenham, London, S.E.26.
E.R. Company, Elliott Works, Elliott Road, Bromley, Kent.
Electroway Heaters, Ltd., Sparrow Hill, Loughborough.
Falco Electrical Appliances, Ltd., Corporation Road, Audenshaw, Manchester.
Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.
Ferranti, Ltd., Hollinwood, Lancs.
French, W. T., & Son, Ltd., Browning Street, Birmingham, 16.
Frost, H., & Co., Ltd., Fieldgate, Walsall.
G.B.M. (Electrical), Birmingham, Ltd., 439, Moseley Road, Birmingham, 12.
Gatehill Manufacturing Co., Ltd., 42, Notting Hill Gate, London, W.11.
General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
Grafton Heater Co., Ltd., 13-15, Westland Place, London, N.1.
Grubb Engineering Co., Ltd., Mary Street, Birmingham, 12.
H.M.V. Household Appliances, Hayes, Middlesex.
Hawkins, L. G. & Co., Ltd., 30-35, Drury Lane, Kingsway, London, W.C.2.
Heatrae, Ltd., Heatrae Works, Norwich.
Hotpoint Electric Appliance Co., Ltd., Peterborough.
Hounslow, C., & Co., Ltd., Chalex Works, Southwick.
I.R.L. Products, Ltd., Upper Bristol Road, Bath.
Kego Electric Co., Ltd., Mount Pleasant, Wembley.
Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Birmingham, 11.
Monarch Electric, Ltd., Vicarage Road, Lye, Worcs.
Morley, T. B., & Co., Ltd., Jameson Street, Hull.
Morphy-Richards, Ltd., 6, Conduit Street, London, W.1.
Premier Electric Heaters, Ltd., Keeley Street, Birmingham, 9.
Reeves Electrical & Radio Co., Ltd., Reelek Works, Baldock.
Revo Electric Co., Ltd., Tipton, Staffs.
Sperryn & Co., Ltd., Moorsom Street Works, Birmingham, 6.
Telsen Electric Co. (1935), Ltd., Fitzgeorge Street, Collyhurst, Manchester, 9.
Tym's Electric, Systym Works, Kennard Road, Stratford, E.15.

NEW BOOKS

Electrical Who's Who. Third Edition. Compiled by the *Electrical Review*. Published by Electrical Review Publications, Ltd., and distributed by Iliffe & Sons, Limited, Dorset House, Stamford Street, London, S.E.1. Price 21s net (postage 8d).

This comprehensive guide to the people in the electrical profession and industry first appeared in 1950 and was immediately recognized as something which was badly needed. It has since become an accepted part of the electrical man's reference library. The new edition has been thoroughly brought up to date and a large number of names have been added. A new feature is an index in which the entries are classified under the names of companies, Boards, Government Departments, etc.

Invitations to supply personal particulars were sent to men and women in prominent positions in all sections, including electricity supply, electrical manufacturing, research, trade associations, wholesaling, contracting, consultants, Government Departments, the Post Office, educational institutions, mining, transport, etc. It is claimed that practically everybody of importance in the electrical world is included. The volume is indispensable to those who desire or need to know something about the leaders of the profession and industry.

The Repair of the Small Electric Motor. By K. Wilkinson. Pp. 180; figs. 98. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 20s.

F.h.p. motors of various types are now widely used in all sorts of premises, and are owned and controlled by persons having varying degrees of electrical knowledge. In many cases when such a machine gives trouble it is returned to the makers for a major overhaul. While this practice has advantages in some cases, it often leads to considerable delay in returning the driven machine into commission and may be rather expensive, since many of the defects which occur on such motors are often of a comparatively minor nature and can be rectified by a person having the necessary knowledge and experience. Such knowledge is not possessed by all electricians, however, many of whom have had a rather limited experience of small motors.

In this book the author has endeavoured to incorporate experience of such motors gained over a period of thirty years. He has produced an extremely practical guide, disregarding theoretical treatment and not purporting to describe how to rewind a motor, which information has been dealt with in other books. Of particular interest and use are the pages in which are given terminal markings and connections used in many makes of motors.

This book should be extremely useful to all electricians and fitters, etc., who have to deal with small motors, and also to interested users of such machines. It is written in simple language and should enable even a non-expert to diagnose and remedy many defects.—J.L.W.

BOOKS RECEIVED

Electronics. By Thomas Benjamin Brown. Pp. 459; figs. Chapman & Hall, 37, Essex Street, London, W.C.2. Price 60s in United Kingdom.

Acoustics. By Leo L. Beranek. Pp. 481; figs. McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95, Farringdon Street, London, E.C.4. Price 64s.

Everybody's Book of Electricity. By R. Barnard Way. Pp. 114; figs. Percival Marshall & Co., Ltd., 19 & 20, Noel Street, London, W.1. Price 3s 6d.

Fundamentals of Electrical Engineering in M.K.S. Units. By Edward Hughes. Pp. 470; figs. Longmans, Green & Co., Ltd., 6 & 7, Clifford Street, London, W.1. Price 12s 6d.

Telecommunications. By A. T. Starr. Pp. 454; figs. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 35s.

Electro-plating and Corrosion Prevention. Edited by E. Molloy. Pp. 278; figs. George Newnes & Sons, Ltd., Tower House, Southampton Street, London, W.C.2. Price 18s.

GENERATION AND DEVELOPMENT

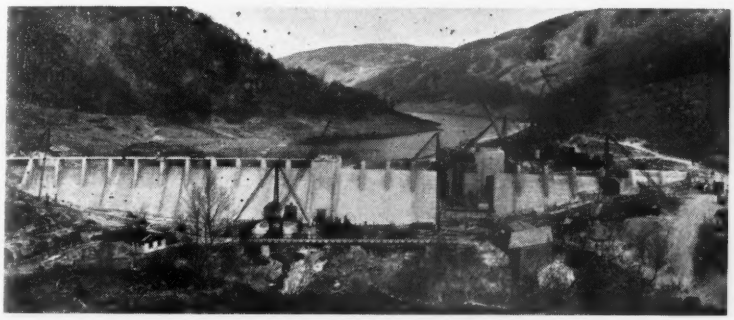
Scottish Hydro-Electric Schemes

On 3rd and 4th September respectively, two new hydro-electric power stations of the North of Scotland Hydro-Electric Board were officially inaugurated. The first of these occasions was the opening of the Loch Luichart power station by the Hon. Mrs. Ian M. Campbell. This power station is situated ten miles west of Strathpeffer and is one of six generating stations which are embraced by what is described as the largest hydro-electric scheme in this country which is being constructed in the valley of the River Conon and its tributaries in Ross-shire. All six stations will have a total installed capacity of 207,000 kW and an estimated annual output of about 442 million kWh. The first stage in the hydro-electric development of the valley is the Fannich scheme which uses water from Loch Fannich to drive the turbines of the power station at Grudie Bridge on the main Dingwall–Achnasheen road. This station has a plant capacity of 24,000 kW and has been in operation since 1950. On the River Meig, a dam has been constructed near Curin from where a tunnel leads the water down to Loch Luichart which has been raised by a dam at its eastern end. From the dam another tunnel leads to the Luichart generating station at the junction of the River Conon and River Meig. The Meig dam is 55ft high and is 565ft long and the Meig tunnel is 8,930ft long and 12·9ft in diameter. The Luichart dam is 52ft high and is 680ft long, and the Luichart tunnel is 4,090ft long and 16ft in diameter. The Luichart power station has installed two 12,000 kW turbo-alternators which operate under a gross head of 185ft.

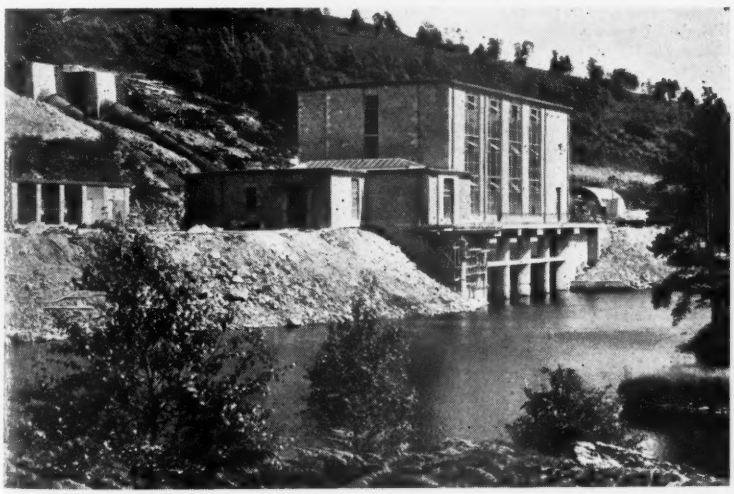
The second power station, Ullapool, was opened by Sir John Cameron, D.Sc., Q.C., Dean of the Faculty of Advocates. Loch Dubh has been enlarged by the construction of a dam 65ft high and some 290ft long. A second dam, some 260ft in length and 40ft in height, is being constructed across the Allt a'Mhuilinn. From this point the water is led to the power station by means of a pipeline the tail race discharging into the Allt a'Mhuilinn. The two 450 kW turbo-alternators operate under a gross head of 543ft.

Higher Charges in Eastern Area?

Although it was hoped that electricity charges could be stabilized until next April, the Eastern Electricity Board has now found it necessary to reconsider the position. This was reported by Ald. W. J. Bennett (chairman) at last week's meeting of the Area Consultative Council. He said a letter had been received from the Board stating that owing to increased costs recommendations would be submitted for raising additional revenue. The Council agreed that its Tariffs Sub-Committee should discuss the proposals with the Board.



The Luichart dam and power station



Transmission Line over River

The British Electricity Authority has applied to the Ministry of Transport for permission to construct a 66 kV overhead line across the River Blyth near Sleekburn, Northumberland. The line is intended to reinforce the electricity system to meet a growing demand in the area.

N.Z. Power Demand Forecast

By 31st March, 1958, the demand for electric power in the North Island of New Zealand will have increased by 11 per cent a year, compounded; in the Nelson–Marlborough district the demand will increase by 9·6 per cent, and in the rest of the South Island by 7·1 per cent a year. These estimates are given in the recent report of the Power and Finance Utilization Committee of the Electrical Supply Authorities' Association. The Committee, which worked in collaboration with representatives of the State Hydro-Electric Department, was set up following a request by the general manager of the department at a conference of the Association in Dunedin last September. The chairman of the Electrical Supply Authorities Association, Mr. C. J. Lovegrove, said in Auckland that in the past the Association had tried to measure power generating needs; now it had presented a report on possible consumer demand over a five-year period. Mr. Lovegrove considered that the position in the North Island called for faster development of the hydro-electric schemes on the Waikato River, and development of geothermal steam resources.

Street Lighting

According to reports DEWSBURY is making a big improvement in its street lighting. From June, 1949, to April, 1954, the number of electric street lamps has increased from 349 to 1,400 while the number of gas lamps has decreased from 1,968 to 1,412. The street lighting engineer, Mr. C. H. Midson, hopes that work on all the main roads will be completed by the winter, by which time another 200 lamps should be converted.

The city surveyor of CARDIFF has recommended the installation of centralized street lighting control equipment at all the substations on the Llanrumney estate at an estimated total cost of £4,680.

CAMBERWELL Works Committee reports that the special sodium lamp fog lantern installed last year at Camberwell Green has proved its worth and the Committee has now agreed to the installation of a further thirty lanterns at selected points in the borough, at an estimated cost of £1,483.

At a special lighting meeting at KINGSWOOD (Wotton-under-Edge, Glos) it was decided to change from gas to electric street lighting. The Midlands Electricity Board quoted £127 for lighting 27 lamps. The Gas Board's price was £6 16s per lamp for 22 lamps for the past season.

REIGATE Borough Council proposes to improve the lighting in a number of streets at a cost of £7,000.

NUNEATON Corporation is to seek sanction to borrow £10,000 for the improvement of street lighting.

Financial Section

STOCKS and SHARES

ACTIVITY in the Stock Exchange remains at a very high level overall. At times it has tended to become rather concentrated at one or two places, notably the sections devoted to stores and mining shares, leaving quieter conditions among gilt-edged and miscellaneous industrial issues. Prices there have been satisfactorily maintained, however, and some particularly good features are to be recorded. One of these in the electrical lists was the jump of 8s 9d to 53s 9d in Aron Meter £1 shares. A substantial buying order was said to have found a shortage of shares on offer. Hoovers were also outstanding in rising another 5s 6d to 50s 3d before reacting to 49s 3d. Brook Motors were belatedly marked up by 5s 9d to 50s in response to the scrip issue proposal.

Price Changes

A further rise of 1s in Aerialites, now 13s 9d, was apparently associated with the reports of equipment required in connection with the introduction of alternative TV programmes. The spectacular rise in Parnall (Yate) progressed by another 1s 9d to 11s. Tube Investments and Westinghouse Brakes were bought, and useful improvements occurred in Aberdare Cables, Dewhurst, Holophane, Hall Telephone and S. Smith. Sturtevant, Greenwood & Batley, Plessey and Enfields all gained 1s or more. A strong revival of interest in Metal Industries raised the shares by 3s. Some radio shares were reactionary, and B.E.T. lost 2s 6d of the previous big advances. Cable & Wireless at 41s 3d are 1s 3d to the good.

Ultra Issues

The rise in Ultra Electric 5s shares went further, to 20s, on news of the new capital proposals. They joined the distinguished company of shares which have approximately doubled in value during the course of the current year. Subject to official consent, ordinary shareholders are to be offered, in respect of each four shares held, one new "A" share free (by way of a capitalization of reserves) and another one share, for cash, at 5s. In an accompanying statement, the point which especially impressed the market was the board's expectation of being able to maintain, on the capital so increased, the 15 per cent rate of dividend paid for the last twelvemonth; this indication follows a report of increasing business in the present year. Assuming in due course a price for the shares of about 14s 3d, ex both issues, the prospective yield on the shares is thus in the region of 5¼ per cent.

Cossor Results

Having declined by 1s to 10s in advance of the annual dividend and profits statements, A. C. Cossor 5s shares have not since shown much change on balance. An initial relapse on the news to nearer 9s was quickly erased. The 10 per cent dividend, for the year ended in March, is at the

The Week's Price Changes

Company or Board	Nom. Value	Middle price 6th Sept.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 High-est	1954 Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	95½	+½	3	3	3 2 10	97	88⅞
Brit. Elec. 1974/77	100	95	+⅛	3	3	3 3 2	96⅛	87⅛
Brit. Elec. 1976/79	100	101⅛	+⅛	3⅛	3⅛	3 9 0	101⅛	93 3/16
Brit. Elec. 1974/79	100	109		4¼	4¼	3 18 0	111⅛	103 3/16
Overseas Electric Supply								
Calcutta Elec.	£1	24/-		6†	6†	5 0 0†	24/6	18/7
East African Power	£1	21/6		7	7	6 10 3	23/4	19/6
Nigerian Elec.	£1	24/-		10	10	8 6 8	25/-	23/6
Palestine Elec. "A"	£1	21/-	+6d	Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	15/-	−9d	Nil	6	8 0 0	16/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	12/-	+6d	25	12½*	5 4 2	12/-	8/1
Aerialite	1/-	13/9	+1/-	88⅛	88⅛	6 8 6	14/-	10/9
Allen, W. H.	£1	76/3	+6d	15	20	5 5 0	76/3	50/-
Aron Elec. Ord.	£1	53/9	+8/9	20	15	5 11 6	53/9	43/-
Assoc. Elec. Ord.	£1	60/9		20	11¼*	3 14 0	61/6	41/6
Automatic Tel. & El.	£1	72/6		15	15	—	73/-	57/3
Babcock & Wilcox	£1	62/3		18	12*	3 17 2	62/3	47/3
Baldwin, H. J.	2/-	4/6		20	20	8 18 0	5/6	3/9
Bakelite	10/-	26/3		12½	12½	4 15 3	27/6	23/6
British Aluminium	£1	35/-	+1/3	12	10	5 14 3	40/-	33/9
B.I. Callender's	£1	47/9		10	10	4 3 9	48/-	37/9
B.I. Callender's 6% Pref. ...	£1	26/6	+6d	6	6	4 11 6	26/6	24/3
British Thermostat	5/-	25/-		35	27½*	—	25/-	12/-
British Vac. Cleaner	5/-	13/6		25	25	9 5 3	14/6	11/6
Brook Motors	10/-	50/-	+5/9	20	20*	4 0 0	50/-	33/3
Brush Ord.	5/-	7/-		4	6	4 2 9	7/6	3/6
Bulgin, A. F.	1/-	3/6		30	30	8 11 6	3/7	3/2
Burco	5/-	17/-		35	35	5 3 0*	17/-	12/1
Chloride El. Storage	£1	66/3		20	12½*	3 15 4	68/-	46/6
Clarke Chapman	£1	72/6	+2/6	17½	20	—	73/-	47/6
Cole, E. K.	5/-	35/-	−9d	25	27½	—	38/9	22/6
Cossor, A. C.	5/-	10/-	−1/-	10	10	5 0 0	11/-	7/-
Crabtree	10/-	28/9		17½	17½	6 1 9	29/6	23/9
Crompton Parkinson Ord. ...	5/-	19/6		11¼	20	5 2 7	19/6	14/-
De La Rue	5/-	18/9	−6d	Nil	20	5 6 8	21/-	12/3
Decca	4/-	43/3	+9d	150	35*	—	43/6	32/-
Desoutter	5/-	22/6	+1/3	18	20	4 9 0	22/6	16/1
Dewhurst	2/-	6/6	+6d	19	19	5 17 0	6/6	5/1
Dictograph Tel.	2/-	6/6		20	20*	6 3 0	6/6	5/2
Dubilier Condenser	1/-	5/9		25	25	4 7 0	6/-	4/1
E.M.I.	10/-	22/-		12	8	3 12 9	22/-	11/3
Electrical Components	5/-	15/-		20	20	6 13 4	15/-	10/9
Elec. Construction	£1	61/3		15	15	4 17 0	61/3	53/-
Enfield Cable Ord.	£1	25/3	+1/9	5	Nil	Nil	25/6	16/6
English Electric	£1	55/-	−3d	15	10*	3 12 9	55/3	38/-
English Electric 3¾% Pref. ...	£1	16/9		3¾	3¾	4 9 7	16/9	15/3
Ericsson Tel.	5/-	26/6		22†	25†	2 7 2*†	28/6	22/9
Ever Ready	5/-	26/-	−3d	35	40	—	26/3	17/9
Falk Stadelmann	£1	40/6	+2/-	15	15	7 8 3	41/-	36/6
G.E.C. Ord.	£1	52/6	−6d	11½	12½	4 15 3	53/-	37/6
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/3	26/6
General Cables	5/-	17/3		30	30	8 14 0	17/3	16/3
Greenwood & Batley	£1	51/3	+1/3	17½	17½	6 16 6	51/3	40/3
Hackbridge Cable	5/-	15/6	+6d	20	20	6 9 0	15/9	11/3
Hackbridge & Hewittic	5/-	22/6		20	25	5 11 0	23/3	16/10
Hall Tel. Acc.	10/-	13/-	+1/-	10	10	7 13 10	13/-	10/6
Heatrae	2/-	5/-		12½	12½	5 0 0	5/-	4/-
Henley's	10/-	20/3		10½	10½	5 7 0	20/3	15/6
Holophane	5/-	16/9	+9d	20	20	5 19 6	17/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

same rate as before. It goes, however, to capital increased during the period by the "rights" issue of shares at 6s, and this time has a better earnings cover, thanks to the reported increase in turnover and net profits; the latter are equivalent to about 15 per cent gross on the ordinary capital. Regarding prospects for the current year, of which five months have now run, the statement says that they have been improved by the ending of hire-purchase restrictions. In the balance-sheet, bank overdrafts have been reduced by over half a million, largely as a result of the share issue.

in Electrical Investments

Company or Board	Nom. Value	Middle price 6th Sept.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	49/3	+4/6	25	45	4 10 6	50/3	26/3
G.I.	£1	37/9	−6d	13	15	3 19 6*	39/-	26/6
Ind. Combustion	5/-	24/-		15	20	4 3 4	24/-	14/6
Johnson & Phillips	£1	52/6		15	15	5 14 3	52/6	47/6
Lancashire Dynamo	£1	59/-		12½	14	4 15 0	59/6	43/-
Laurence, Scott	5/-	23/9		15	20	4 4 3	25/-	14/-
Lister, R. A.	£1	44/-		9	12	5 9 0	44/-	31/9
London Elec. Wire	£1	50/6		15	10*	3 19 4	50/6	38/-
Lucas, J.	£1	38/9	−9d	9⅛	10†	—	39/6	25/3
Marryat & Scott	2/-	7/9		22½	25	6 9 0	7/9	5/11
Mather & Platt	£1	46/6		12½	15	—	47/-	32/-
Metal Industries	£1	36/3	+3/-	12	9	4 19 3	42/3	29/6
Midland Elec. Mfg.	£1	67/6		15	15	4 9 0	67/6	63/-
Morphy-Richards	4/-	23/9	−1/3	40	40	—	25/-	11/4
Murex	£1	55/-	+6d	15	15	5 9 0	57/-	50/-
Newman Ind.	2/-	2/4½		10	10	8 8 5	2/6	2/-
Oldham & Son	1/-	3/3		17½	17½	5 7 8	3/4	2/5
Parnall (Yate)	5/-	11/-	+1/9	6	8	3 12 9	11/-	4/3
Parsons, C. A.	£1	60/-		12½*	7½*	2 10 0	60/-	38/1
Plessey	10/-	58/9	+1/3	25	30	—	58/9	37/10
Pye Deferred	5/-	31/6	−1/-	20	20*	3 3 6	32/6	15/7
Revo	10/-	14/-		27½	9*	6 8 6	20/3	14/-
Reyrolle	£1	92/6		12½	13⅜	3 0 0	92/6	66/-
Rheostatic	4/-	15/9		19	20	5 1 7	15/9	11/-
Richardsons Westgarth	5/-	11/9		15	15*	6 7 8	12/3	6/6
Scottish Cables	4/-	21/-	−3d	20	27½	5 4 9	21/3	12/11
Siemens Ord.	£1	39/-	−3d	10	10	5 2 6	43/9	33/9
Smith (England), S.	4/-	13/6	+3d	12½	15	—	13/6	7/8
Southern Areas	£1	26/3	+1/3	6	7½	5 14 3	27/6	17/6
Strand Elec.	5/-	9/3		17⅛	17⅛	9 9 3	9/3	8/3
Sturtevant	5/-	44/-	+1/6	18·1†	18·9*†	2 3 0†	44/-	29/-
Sun Elec.	£1	32/6		15	15	9 4 8	32/6	27/6
Switchgear & Cowans	5/-	12/9		22½	10	3 18 6	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½*	5 13 9	12/4	10/7
T.C.C.	10/-	36/3	+1/3	20	30*	—	36/3	21/3
T.C. & M.	£1	33/6		10	8½*	5 1 6	34/6	30/3
Telephone Mfg.	5/-	9/6		10	10	5 5 3	9/6	7/6
Thorn Elec.	5/-	26/6		12½	20	3 15 6	27/-	13/3
Thornycroft	£1	44/-	+1/-	15	15	6 16 3	47/6	33/4
Tube Investments...	£1	71/3	+2/6	15*	15	4 4 3	71/3	60/3
Vactric	5/-	17/-		Nil	10	2 18 9	18/9	7/6
Veritys	5/-	7/6		10	12½	8 0 8	8/3	5/-
Walsall Conduits	4/-	51/3		70	70	5 9 4	52/6	44/-
Ward & Goldstone	5/-	38/9		45	50	—	38/9	21/-
Watford	2/-	6/9		25	22½*	—	6/9	4/7
Westinghouse Brake	£1	73/9	+1/3	14	15	4 1 3	73/9	60/9
West, Allen	5/-	16/6		15	17½	5 6 1	16/6	12/7
Wolf Electric	5/-	14/9		15	17½	5 18 9	14/9	11/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	83½		—	6	7 3 9	89½	80
Ord.	100	54½	+2	—	3⅞	6 17 6	55½	52
Anglo-Portuguese	£1	24/3		8	8	6 12 0	24/3	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	61/3	−2/6	35	50	4 1 9	63/9	39/1
Cable & Wireless:								
Ord.	£1	41/3	+1/3	8	9	4 7 2	40/6	26/2
4% Loan	100	98⅛		4	4⅛	4 1 3	98⅛	95⅛
Calcutta Trams	£1	23/6	−1/-	2½†	6†	5 2 2	24/6	17/1
Cape Elec. Trams	£1	17/-		5½	7½	8 16 6	17/6	12/4
Marconi Marine	£1	33/9		10	10	5 18 6	33/9	27/6
Oriental Tel. Ord.	£1	92/6		16	16	—	95/-	82/6
Telephone Props.	£1	5⅛		8	8	—	5⅛	4⅛
Telephone Rentals	5/-	10/3	−3d	10	10*	—	10/6	9/-

Interesting Interims

Interim dividend declarations of moment have come from Chloride Electrical Storage and Telegraph Condenser. Both companies are repeating the rates of last year's interim payments, but on capital doubled intermediately by free scrip distributions. Chloride Electric shares remained firm at 66s 3d: the market feels encouraged to speculate on a possible total of 15 or 17½ per cent on account of 1954, against the equivalent of 12½ per cent paid for 1953. Telegraph Condenser last distributed 20 per cent as dividend and 10 per cent as bonus, on half the present capital. Expectations are counting tentatively on the maintenance of the dividend rate, without the extra 10 per cent. British Thermostat's decision to repeat last year's interim dividend rate on the present larger capital is stated to be made with the object of bringing the interim and final rates closer together.

Desoutter Dividends

Desoutter Brothers (Holdings) 5s shares have retained the rise of about 1s 6d to 22s 6d induced earlier by the announcement of the increased interim dividend on account of the current year, which ends in December. This 10 per cent payment compares with last year's 7½ per cent interim, which was followed by a final making a total of 20 per cent for the year. Earnings in 1953 covered that distribution comfortably three times over, despite a heavy liability to the now defunct Excess Profits Levy, and the annual report gave a satisfactory review of prospects in the period now running. At their present price, the shares offer a yield rather less than 4½ per cent on last year's rate of dividend, but without taking into account any implications arising from the recent dividend announcement.

Company Notes

R. B. Pullin 2s ordinary have been favoured lately, a rise to about 4s 9d taking the quotation to the best level for many years. Financial year of the company ends this month, and the results may be expected early next year. For the last period, dividends totalling 15 per cent were paid, and the accounts provided yet another example of an excess profits levy charge being larger than the net amount of the distribution. Other relatively small-priced shares to attract present support are the 1s ordinary of Motor and Electronics Corporation (formerly Rothermel Corporation), now quoted at nearly 4s. H. J. Baldwin 5s shares were unchanged at 4s 6d after the announcement of the maintenance of the ordinary dividend at 20 per cent, and of a net profit also at about last year's level.

REPORTS and DIVIDENDS

The East African Power & Lighting Co., Ltd.—The annual meeting was held in Nairobi on 3rd September, Major C. M. Taylor (chairman) presiding. In the course of his speech the chairman said that a steady rate of development was shown in all their areas of supply during the year under review and group sales of electricity rose from 161·9 million kWh to 188·8 million. Since April last they had been able to meet consumers' requirements in full in all areas, and with a large volume of plant now being installed or coming forward, he was confident that they could meet any demands which might be made upon them. Capital expenditure not provided for in the accounts was estimated to be £3,522,256 for the group. The major works concerned in the Nairobi area were the balance of the 8,000 kW hydro-electric scheme at Tana which should be in service early in 1955; the 66 kV transmission system now nearly complete; the 4,720 kW thermal extension at Nairobi South; and the 5,000 kW gas turbine plant at Nairobi South, the first unit of which would be shortly in service. In Mombasa work had begun on the new 10 MW steam turbine station at Kipevu estimated to cost £800,000. In Tanganyika contract commitments amounted to £564,436, and since the end of the year they had placed on order a further 4,500 kW of oil engine plant to supplement the Nairobi supplies at an estimated cost of £350,000.

A bulk supply agreement had been reached with the Uganda Electricity Board, and they had formed, in conjunction with the Government of Kenya and the Power Securities Corporation, a new company, the Kenya Power Co., Ltd., to deal with this bulk supply from the Uganda Board, and also other supply matters.

Parmiter, Hope & Sugden, Ltd.—In the course of his speech at the annual meeting held on 1st September, Mr. E. W. Sugden (chairman), said that a return to the almost unlimited demand for goods of a few years ago was not to be expected. Referring to the problem of price levels in relation to the continued rise in costs, the chairman said that although they had been able to keep prices unaltered since the last advance in January, 1952, it was difficult to see how this stability could be maintained if still further increases in costs were to be experienced in the future. The directors considered that the preference shares, which had for some time represented capital in excess of the company's needs should now be repaid. During the year improvements had been made in the equipment and layout of the works and the offices had been extended. The sales of recent new designs of house service fuses continued to expand, and new ranges of high breaking capacity cartridge fuse-links had been produced in recent months. These would enable the metalclad distribution gear, in which they specialized, to keep pace with the technical requirements of modern plant. Further new designs were in hand with the same object in view, and also that of meeting special markets overseas.

The Electric Furnace Co., Ltd.—The consolidated accounts for the year to 31st March last show a trading profit of £287,671, as compared with £185,738 for 1952–53, and after meeting all charges, including £141,337 for taxation, the net balance is £78,573 (against £45,621). A sum of £76,351 is placed to general reserve of the holding company, and it is proposed to pay a final ordinary dividend of 6½ per cent, making 10 per cent for the year (against 12½ per cent). The balance carried forward is £25,095 (against £22,997 brought in).

During the year the preferred ordinary shares were converted to 7 per cent cumulative preference shares and the holders were issued with additional preference shares in the proportion of three new preference shares for each seven old preferred ordinary shares. Ordinary shareholders received a bonus of one full-paid ordinary share for each share held.

Mr. D. F. Campbell (chairman) states that a new factory is to be built in the London area to meet the growing requirements of the group and particularly of the wholly-owned subsidiary Electro-Chemical Engineering Co., Ltd. In metal heating and melting technical progress is being made and several new fields of activity are developing satisfactorily in the steel, non-ferrous and engineering trades. The demand for metal-melting equipment is somewhat reduced owing to the over-expansion of normal capacity during the Korean rearmament programme. The Electric Resistance Furnace Co., Ltd., has maintained steady output and the new Canadian venture, EFCO-Lindberg, Ltd., has made satisfactory progress. The work in hand is less than at this time last year, but the outlook for the current year is satisfactory.

Ultra Electric (Holdings), Ltd., proposes, subject to the consent of H.M. Treasury being obtained, to issue by way of rights for cash 372,500 "A" ordinary shares of 5s each and to recommend to shareholders the issue of 357,500 "A" ordinary shares of 5s each by way of capitalization of reserves. Under the proposal shareholders will be given the right to subscribe in cash for one "A" ordinary share for every four ordinary shares held and will receive by way of capitalization of reserves one "A" ordinary share for every four ordinary shares held. The "A" ordinary shares will rank for dividend and in all other respects equally with the existing ordinary shares except that the holders of the "A" ordinary shares will not have the right to vote except in certain circumstances. It is intended that the rights issued will be at 12s per share. It is also intended to increase the authorized share capital to £750,000. An extraordinary meeting will be held on 17th September to consider the proposals.

Phœnix Telephone & Electric Holdings, Ltd., reports consolidated trading profits for the year ended 28th February last of £269,039, as compared with £240,937 for the preceding year, and after providing for depreciation and £72,800 for taxation, the net profit is £54,915 (against £48,474). General reserve receives £20,000 and it is proposed to pay an ordinary dividend for the year of 15 per cent (against 10 per cent), leaving £19,907 to be carried forward (against £11,246 brought in).

In his statement, Mr. G. F. Shipman (chairman) says that output and sales to date during the current financial year show increases as compared with the corresponding period of last year, and the volume of orders in hand is sufficient to absorb output for many months ahead.

Berry's Electric, Ltd.—The accounts for the year ended 31st March last show a trading profit, with other income, of £91,870, as compared with £50,394 for the preceding year, and a net profit, after meeting all charges, including £33,458 for taxation, of £30,361 (against £7,873). It is proposed to place £45,646 to general reserve, and to pay a dividend for the year of 7½ per cent (against 5 per cent). The balance carried forward is £19,756 (against £40,529 brought in).

The British Thermostat Co., Ltd., has announced an interim dividend of 7½ per cent on the ordinary capital increased by a 50 per cent scrip issue for the year ending 31st January, 1955. The directors state that they believe that shareholders would prefer that the rate of the interim and final dividends should be more closely related. For the previous twelve months before the scrip issue, shareholders received a final dividend of 12½ per cent and a bonus of 7½ per cent, making a total of 27½ per cent for the year.

The Nico Light Engineering Co., Ltd., reports a trading profit for the year to 31st March last of £38,875, as compared with £44,923 for the previous year, and after deducting all charges, including £10,377 for taxation, the net balance is £8,494 (against £10,473). The dividend for the year is unchanged at 10 per cent, and the bonus of 10 per cent is repeated. The balance carried forward is £10,138 (against £11,598 brought in).

A. C. Cossor, Ltd.—The accounts for 1953–54 show a group trading profit of £527,419, as compared with £464,917 for the preceding year, and after deducting depreciation and £213,517 for taxation, the group net profit is £162,013 (against £105,293), of which £142,260 (£89,417) is attributable to the parent company. It is proposed to pay a dividend of 10 per cent (unchanged) for the year on the ordinary capital increased from £600,000 to £1,000,000 in October last. The group balance carried forward is £179,612 (against £119,535 brought in).

Walsall Conduits, Ltd., has declared an interim dividend of 20 per cent actual, less tax, on the ordinary shares (unchanged).

The Chloride Electrical Storage Co., Ltd., is to pay an interim dividend of 5 per cent on the "A" and "B" ordinary stock.

The Telegraph Condenser Co., Ltd., has declared an interim dividend on the ordinary capital of 5 per cent (unchanged) on increased capital.

New Companies

Vitromic Electric Products, Ltd.—Registered 31st July. Capital £2,000. Inventors, designers, and manufacturers of and dealers in electrical apparatus, plant and machinery, etc. The first directors are A. L. G. Cianchi and D. P. Cianchi. Solicitors: Bull & Bull, 11, Stone Buildings, W.C.2.

"Gammatron" Nucleonics, Ltd.—Registered 21st August. Capital £100. Manufacturers and sellers of and dealers in radio-isotope equipment, instruments and apparatus, designers and engineers of electronic and nucleonic appliances, etc. Directors: Sir James Marshall-Cornwall and J. Berman.

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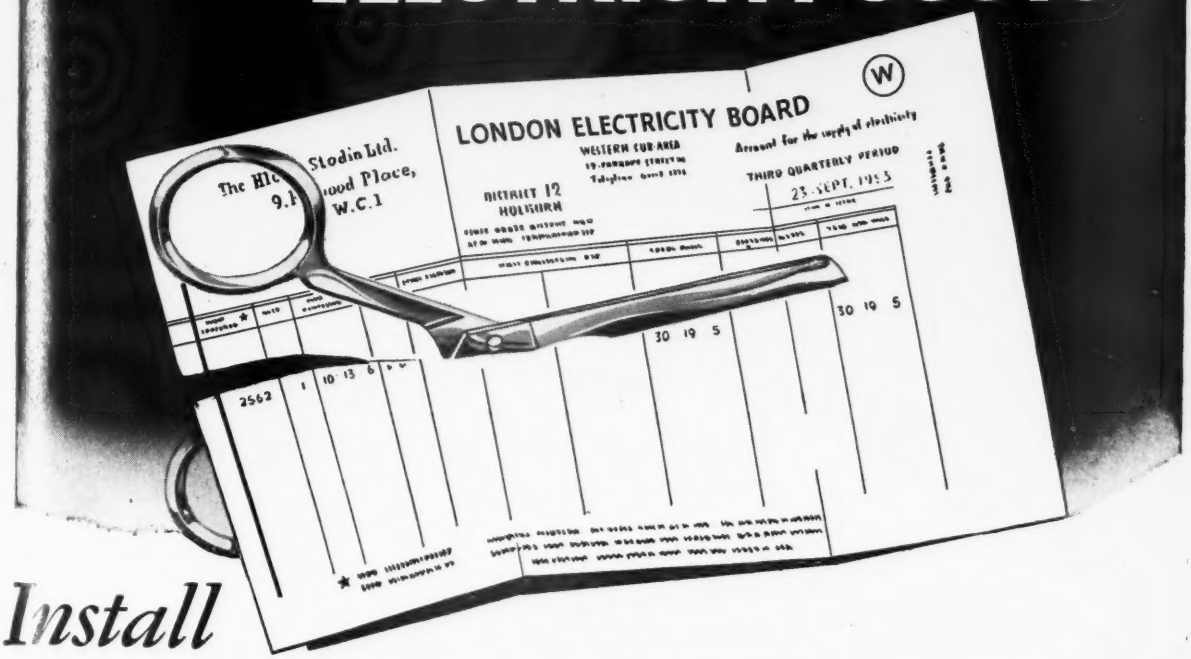

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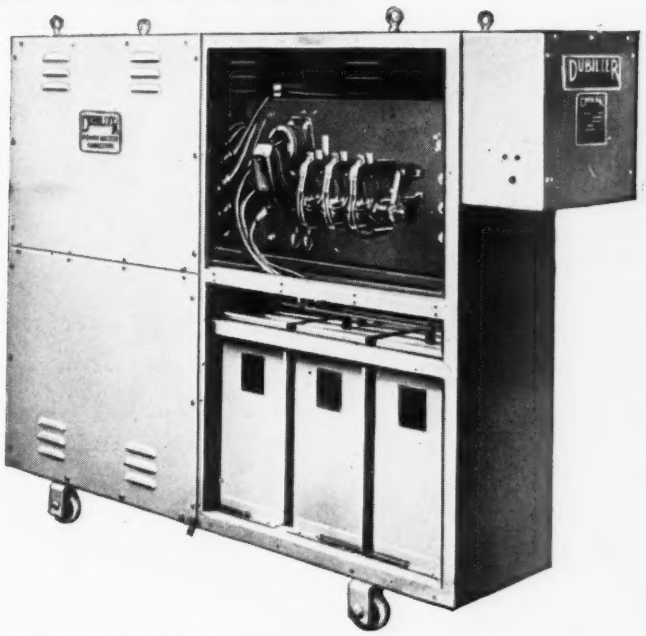

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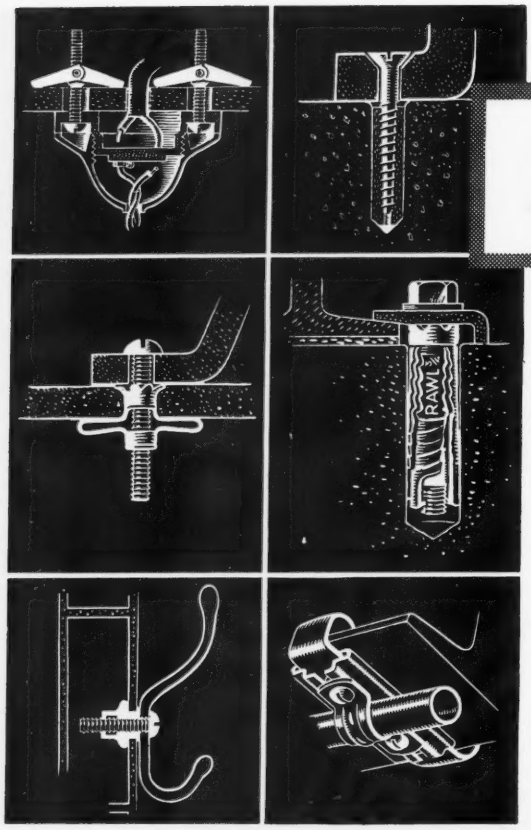

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 20th October from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

[illegible]5038. Werner, W. A. P.—Method and [illegible]ans for utilizing the rise and fall of the tides [illegible]the production of energy. 4th September, [illegible]0. (717112.)

[illegible]

[illegible]0. National Research Development Cor[illegible]tion.—Digital computers. 20th December, [illegible]. (717114.) 986. Electronic storage d[illegible]ces. 5th January, 1951. (717115.) [illegible]. Tree type electrical circuits. 5th F[illegible]uary, 1951. (717118.)

[illegible]

[illegible]85. General Electric Co., Ltd., Busby, T[illegible]S., Manners, M., and Partridge, J. H.—R[illegible]actory materials. 27th February, 1952. ([illegible]956.)

[illegible]93. National Research Development C[illegible]poration.—Beat frequency oscillators. 24th M[illegible]ch, 1952. Cognate application 25722, 2nd N[illegible]ember, 1951. (717122.)

[illegible]45. General Electric Co., Ltd., Brook, F[illegible]nd Jackson, K.—Manufacture of porous m[illegible]al bodies. 2nd April, 1952. (717034.)

[illegible]24. Heinrich, D. O.—Two-stage elec[illegible]tatic precipitators. 16th January, 1952. ([illegible]959.)

[illegible]739. Metropolitan-Vickers Electrical Co., L[illegible]—Winding and haulage equipment. 29th Fe[illegible]uary, 1952. (716962.)

[illegible]001. Licentia Patent-Verwaltungs Ges.—Co[illegible]trol system for electric motors. 31st May, 19[illegible]. (717123.)

[illegible]7825. Unilever, Ltd.—Apparatus for measuring dielectric properties of materials. 22nd July, 1952. (717127.)

[illegible]7922. Simplex Electric Co., Ltd.—Rotary-electric switches. 25th July, 1952. (716967.)

[illegible]1439. Standard Resistance Welders, Ltd., and Reeves, C. J.—Phase convertors and balancer units for electricity supply systems. 1st September, 1952. (716973.)

27719. National Research Development Corporation.—Electrical pulse generating circuits. 11th November, 1952. (717138.)

28180. General Electric Co., Ltd., Bate, H. C., and Bowtell, J. N.—Electroluminescent devices. 26th November, 1952. (717169.)

29000. General Electric Co., Ltd., Bate, H. C., and Miles, E. E.—Electroluminescent devices. 11th December, 1952. (717170.)

29150. Marconi's Wireless Telegraph Co., Ltd.—Voltage clamping circuit arrangements. 3rd September, 1952. (717139.)

29758. General Electric Co., Ltd., and Jenkins, H. G.—Electroluminescent devices. 10th December, 1952. (717171.)

1952

28. Martin Co., G. L.—Variable ratio booster control system for aircraft. 1st January, 1952. (717141.)

708. General Railway Signal Co.—Code communication systems. 9th January, 1952. (717142.)

1359. National Research Development Corporation.—Electronic valve circuits. 6th January, 1953. (717055.)

7857. Etablissements Merlin & Gerin.—Protection of electrical apparatus against arcing. 27th March, 1952. (716998.)

8221. Davies, D. H., and Kirby, F. H.—Electric fires. 25th August, 1952. (717188.)

8392. British Thomson-Houston Co., Ltd.—Reversible transmission systems. 18th November, 1952. (717189.)

8884. Siemens-Schuckertwerke Akt.-Ges.—Mechanical contact convertor. 7th April, 1952. (716905.)

9161. Bosch Ges., R.—Electric condensers. 10th April, 1952. (717150.)

9444. Compagnie Générale de Télégraphie sans Fil.—Magnetrons. 15th April, 1952. (717001.)

9935. Imperial Chemical Industries, Ltd.—Ventless delay electric initiators. 9th January, 1953. (716909.)

10333. Telefonaktiebolaget L. M. Ericsson.—Device for the amplification of so-called voice and signalling voltages for radio or telephony purposes. 24th April, 1952. (716912.)

10575. General Motors Corporation.—Centrifugal electric switches. 28th April, 1952. (716913.)

11977. British Dielectric Research, Ltd.—Manufacture of electric capacitors. 11th May, 1953. (716917.)

12599. Philips Electrical Industries, Ltd.—Devices for treating work-pieces of a tubular shape by inductive heating in a magnetic high-frequency field. 19th May, 1952. (717067.)

13073. Revo Electric Co., Ltd.—Electric switch box. 26th May, 1953. (717068.)

13336. Moser-Glaser & Co. Akt.-Ges.—Electric transformers. 26th May, 1952. (717070.)

14093. British Insulated Callender's Cables, Ltd.—Methods of forming protective coverings about electric cables, pipes and the like. 4th June, 1953. (716922.)

14273. Telefunken Ges. für Drahtlose Telegraphie.—Multi-channel pulse communication systems. 5th June, 1952. (717075.)

14356. Siemens & Schuckertwerke Akt.-Ges.—Self-cleaning outdoor high-tension insulators. 6th June, 1952. (716924.)

15479. British Broadcasting Corporation.—Automatic monitoring of telecommunications apparatus. 19th June, 1953. (717083.)

15488. General Electric Co., Ltd., Breadner, R. L., and Simms, C. H.—Glass-to-metal seals. 19th June, 1953. (716927.)

16212. Akt.-Ges. Brown, Boveri & Cie.—Device for resynchronizing synchronous machines which have fallen out of step. 27th June, 1952. (716929.)

17406. Kuhl, G. H.—Method and apparatus for increasing the fidelity of a sound reproducing system. 10th July, 1952. (717210.)

18140. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone exchanges with staff locators. 17th July, 1952. (717216.)

19698. Metropolitan-Vickers Electrical Co., Ltd.—Thermionic valve coupling circuits. 5th June, 1953. (717217.)

22426. General Electric Co.—Electric switching devices actuated by bimetallic elements. 5th September, 1952. (717017.)

25580. Knottnerus, L. F. A.—Control of asynchronous induction motors. 13th October, 1952. (717020.)

26741. Western Electric Co., Inc.—Data storage circuits and memory elements therefor. 24th October, 1952. (717104.)

27405. Western Electric Co., Inc.—Pulse amplifiers using transistors. 31st October, 1952. (717106.)

27652. Chatham Electronics Corporation.—Gas-discharge device. 3rd November, 1952. (717108.)

28066. Westinghouse Electric International Co.—Automatic electric circuit breakers and trip devices therefor. 7th November, 1952. (716948.)

29913. Spladis Soc. pour l'Application d'Inventions Scientifiques. — Electro-medical apparatus. 26th November, 1952. (717226.)

30451. Bendix Aviation Corporation.—Pressure responsive electric switch devices. 1st December, 1952. (717228.)

1953

17934. National Research Development Corporation.—Electric circuits. 24th March, 1952. Cognate application 17935/53, 3rd November, 1951. Divided out of 717122. (717160.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 1st October:—

VERSELLA. No. 719,418, Class 7. Electrically operated machines for polishing, scrubbing, waxing floors, cleaning floors with steel wool, oiling floors, shampooing rugs, and picking up water from washed floors, none being for domestic use; and machines for sanding floors and wringing and washing machines. VERSELLA. No. 719,419, Class 9. Machines as above, but for domestic use; and vacuum cleaners, vacuum dust extractors and carpet sweeping machines, all being electrically operated.—Otto Müller Brütsch & Dora Lenggenhager, trading as Müller-Brütsch & Co., Zurich, Switzerland. Address for service, c/o Trade Mark Protection Society, 50, Lincoln's Inn Fields, London, W.C.2.

MORPHY-RICHARDS. No. 722,708, Class 7. Domestic mixing, mincing and hair drying machines, all electrically operated, and parts. MORPHY-RICHARDS. No. 722,709. Bells, bell systems, buzzers, bell transformers, cigarette and cigar lighters, door openers, soldering irons, vacuum cleaners, floor polishing machines, floor scrubbing machines, tea infusers, kettles, coffee percolators, casseroles, tea pots, hot water jugs, milk boilers, pots and pans, all being electrically operated goods for domestic use, and parts and fittings; parts of electric chimes for doors and of electric flat irons; and flex supports for electric flat irons. MORPHY-RICHARDS. No. 722,710, Class 11. Cooking apparatus, fans, immersion heaters, hot plates and hair drying appliances (not machines), all being electrically operated goods for domestic use; and parts and fittings.—Morphy-Richards, Ltd., St. Mary Cray, Kent.

ARMOURLUMIN. No. 722,214, Class 9. Electric kitchen utensils included in class 9.—Great Universal Stores, Ltd., Devonshire Street, Ardwick, Manchester, 12.

CLAREIAC. No. 726,876, Class 9. Electrical instruments included in class 9; and testing instruments.—J. N. de Gruchy, trading as Clare Instrument Co., 1, Beaconway, Rickmansworth, Hertfordshire.

RAI-TEL-ADE (design). No. 729,638, Class 9. Attachments for radio and television apparatus for use in providing individual sound amplification and tone control for persons with defective hearing.—W. J. L. Longland, trading as Electric Ades, 2, Orchard House, Thames Street, Sunbury-on-Thames, Middx.

FALKS. No. B730,037, Class 9. Electrical apparatus and instruments and parts thereof, all included in Class 9.—Falk Stadelmann & Co., Ltd., Veritas House, 91, Farringdon Road, London, E.C.1.

DECCA. No. 731,622, Class 9. Scientific, nautical, surveying, navigating, optical, radio, radar, television, signalling, teaching and measuring apparatus and instruments; and electrical and electronic apparatus and instruments.—Decca Record Co., Ltd., 1 and 3, Brixton Road, London, S.W.9.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — SYDNEY. — 14th December. Snowy Mountains Hydro-Electric Authority. Seven 56 MVA transformers and ancillary equipment. (See this issue.)

BRISBANE.—7th October. Southern Electric Authority of Queensland. Six 110 kV automatic outdoor type switchgear units. (E.S.B. 20793/54. Ten/10589.)*

Belfast.—24th September. Electricity Department. Fluorescent street lighting equipment. General manager, Electricity Department.

Belgium. — BRUSSELS. — 16th November. Ministry of Colonies. Electrical distribution equipment at the Leopoldville Airport, Belgian Congo. (E.S.B. 20820/54. Ten/10503.)*

Burma. — RANGOON. — 28th September. Electricity Supply Board. Electrical material. (E.S.B. 21333/54. Ten/10583.)*

15th October. Director General, Industrial Development Corporation. Substation for jute mill power supply. (E.S.B. 21334/54. Ten/10582.)*

Canada.—SASKATCHEWAN.—30th September. Saskatchewan Power Corporation. 2,500 kW gas-diesel generating unit. (E.S.B. 20937/54. Ten/10571.)*

Chigwell.—17th September. U.D.C. Repairs and extensions to electrical installations in 180 houses in Chigwell, Loughton and Buckhurst Hill. Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill, Essex.

Dungannon.—17th September. Northern Ireland Fire Authority. Electrical sub-contract in connection with fire station under construction at Thomas Street. Cosgrove & Rooney, civil engineers, 13, James Street, Cookstown, Co. Tyrone.

Egypt.—CAIRO.—15th September. Cairo Electricity & Gas Administration. L.v. cables. (E.S.B. 20857/54. Ten/10507.)*

India.—29th September. India Store Department, London. Portable diesel-electric generating sets. (See this issue.)

BANGALORE. — 22nd September. Government of Mysore Stores Purchase Committee. Galvanized iron telegraph wire. (E.S.B. 20960/54. Ten/10524.)*

NEW DELHI.—21st September. Director General, Supplies and Disposals. Electric cable. (E.S.B. 21085/54. Ten/10551.)* 29th October. 30,000 kW steam generating plant. (E.S.B. 21298/54. Ten/10581.)* 23rd November. Fuse sets. (E.S.B. 21288/54. Ten/10563.)* 24th November. Isolating switch, fuses, etc. (E.S.B. 21289/54. Ten/10564.)* 25th November. Oil circuit breakers, automatic reclosers, bank of capacitor, isolating switches. (E.S.B. 21396/54. Ten/10612.)*

Indonesia. — DJAKARTA. — 30th September. Ministry of Economic Affairs. Two diesel engined generating sets (25 to 27½ kVA). (E.S.B. 20674/54. Ten/10481.)*

Lurgan.—11th October. Lurgan and District Waterworks Joint Board. Supply and installation of switchboards, fuseboards, cables, conduits and accessories necessary for power and lighting scheme. Ernest Reid, M.Sc., consulting engineer, College Gardens, Belfast.

New Zealand. — WELLINGTON. — 13th October. Post and Telegraph Department. Glass cartridge fuses, fuse holders and fuse wire. (E.S.B. 20513/54. Ten/10452.)* 14th October. Electric lamps and associated fittings. (E.S.B. 21122/54. Ten/10554.)* 2nd November. Potentiometers and resistors. (E.S.B. 21104/54. Ten/10552.)* 11th October. Components testers. (E.S.B. 21103/54. Ten/10573.)* 6th October. Communications radio receivers. (E.S.B. 21110/54. Ten/10569.)*

AUCKLAND.—8th October. Auckland Electric Power Board. Aerial cable. (E.S.B. 21176/54. Ten/10557.)*

Norwich.—24th September. Corporation. Electrical switchgear cables and accessories at Whitlingham sewage disposal works. (See this issue.)

Persia.—TEHRAN.—27th September. Procurement Office, Iran-American Joint Fund for Technical and Economic Development. Transformers, insulating materials, panel boards, cable and connector boxes. (E.S.B. 20515/54. Ten/10457.)*

Portuguese West Africa.—ANGOLA.—19th October. Amboirn (Angola) Local Board. Equipment for supplying electricity to the town of Gabela. (E.S.B. 20389/54. Ten/10421.)*

South Africa.—PRETORIA.—30th September. Union Tender and Supplies Board. Radio valves, antennas and speaker cabinets. (E.S.B. 20459/54. Ten/10431.)*

JOHANNESBURG.—30th September. Stores Department, South African Railways. Six diesel alternator sets. (E.S.B. 21052/54. Ten/10533.)* Cable. (E.S.B. 21054/54. Ten/10536.)*

Southern Rhodesia.—SALISBURY.—15th September. Voltage regulators and spares. (E.S.B. 21071/54. Ten/10505.)* 22nd September. 11kV circuit breakers. (E.S.B. 21072/54. Ten/10531.)*

Spilsby.—11th October. R.D.C. Pumps, complete with motors, starters, switchgear, instruments, etc., for Driby water supply scheme. Binnie, Deacon & Gourley, engineers, Artillery House, Artillery Row, Westminster, S.W.1.

Thetford.—30th September. Borough Council. Street lighting installation, trunk road A.11. Borough surveyor, Municipal Offices.

United States.—DENVER, COLORADO.—16th September. Bureau of Reclamation. Three 69 kV transformers for Williston substation, Fort Peck Project, North Dakota. (E.S.B. 20630/54. Ten/10541.)* Two potential transformers. (E.S.B. 20646/54. Ten/10559.)*

Uruguay. — MONTEVIDEO.—24th September. Administracion de las Obras Sanitarias del Estado. Equipment, including an electrical power distribution system for an extension to the Montevideo waterworks. (E.S.B. 21335/54. Ten/10585.)*

Wigan. — 20th September. Borough Council. Electrical work in connection with housing schemes. Borough engineer, Municipal Buildings, Hewlett Street.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnsley.—Factory and warehouse, Queen Street South; Legard & Son, Ltd., leather merchants, 2 & 3, Queen Street South.

Blyth.—Cinema, Post Office Square, for Essoldo Circuit Control, Ltd., 42, Westgate Road, Newcastle-on-Tyne.

Bootle.—Cinema, Stanley Road; Circuits Management Association, Ltd., 59, New Oxford Street, London, W.C.1.

Bournemouth.—Theatre, café, etc., on the Pier; W. L. Clowes, borough surveyor, Town Hall.

Bristol.—Development of site at Haymarket/Merchant Street; G. A. Dunn & Co. Ltd., hatters, 335, Royal College Street, London, N.W.1.

Offices, canteen, etc. (£90,000), on site at Mangotsfield, for Carsons, Ltd., chocolate manufacturers, Shortwood; Angus MacDonald & Partners, architects, 1, Unity Street, Bristol.

Bury.—Adaptation of building as a hostel for aged (£20,670); county architect, County Hall, Preston.

Chester.—Factory; Edward Dean & Son (Millers), Ltd., bakers and confectioners, Upton Mills.

Clay Cross (Derbys).—Rebuilding the Hippodrome Theatre; A. J. Thraves & Son, architects, Whitefriars House, Friar Lane, Nottingham.

Coventry.—Rebuilding of Christ Church; A. H. Gardner & Partners, architects.

Dudley.—Factory, Birmingham Road (£40,000); Joseph Gillott & Sons, Ltd., pen manufacturers, Graham Street, Birmingham.

Exeter.—Rebuilding of printing works; W. Pollard & Co., Ltd., Southernhay Gardens.

Falkirk.—Large extensions to premises in High Street (£58,000); Marks & Spencer, Ltd., 82, Baker Street, London, W.1.

Haslingden.—Factory; Durie & Miller, Ltd., Farholme Mill, Stacksteads, Bacup.

Haywards Heath.—Bus station and garage for Southdown Motor Services, Ltd., Brighton; Ringmer Building Works, Ltd., contractors, Ringmer, Lewes.

King's Lynn.—Three storey blocks of shop and flats, Gaywood Park; G. Holmes, architect, Clifton House, Queen Street.

London.—CAMBERWELL.—Workshops and offices, Parkhouse Street; Orchard & Peet, Ltd., builders, 32, Leopold Road, S.W.19.

ST. MARYLEBONE.—Flats, 147/165, Lisson Grove; Armstrong & MacManus, architects, 28, Gloucester Place, W.1.

STEPNEY.—Dwellings (55), Spital Street; borough engineer.

Newburn-on-Tyne.—Licensed premises at Throckley for Newcastle Breweries, Ltd. (£32,000); R. W. Bell & Co., builders, Mistletoe Road, Newcastle-on-Tyne.

Newbury.—Laundry, Queen's Road; Newbury Laundry, Ltd., York Road.

North Riding.—Eight new schools at Redcar, Stokesley, Eston, Northallerton, Colburn, Thirsk, Guisborough and Skelton (next year's programme); D. W. Dickenson, school architect, County Hall, Northallerton.

Northwich.—Maternity unit for Davenham Hospital; Halliday & Agate, architects, 14, John Dalton Street, Manchester.

Oldbury.—Houses (89), Brandhall estate; Titford Property Co., Ltd., New Road, Langley.

Sheffield.—Experimental station; British Steel Castings Research Association, Broomgrove Lodge, Broomgrove Road.

Southampton.—Factory, Millbrook; Addy Products, Ltd., manufacturing engineers, Belvidere Terrace.

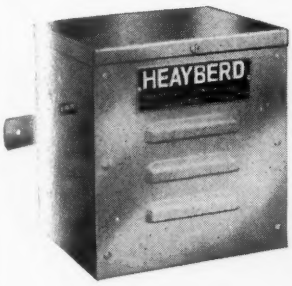
Stanley (Co. Durham).—Factory additions at Craghead for Webwear, Ltd.; J. H. Napper, architect, Eldon Place, Newcastle-on-Tyne.

Sutton Coldfield.—Factory at Reddicap Hill, for B. M. S. Laminations, Ltd.; B. Allington, Bassets Pole, Sutton Coldfield.

Swindon.—Proposed new hospital; Oxford Regional Hospital Board, 43, Banbury Road.

Wortley.—Houses and flats (56), at Lane End Estate, Chapeltown, for R.D.C.; Husband & Co., Council's consultants, 388, Glossop Road, Sheffield, 10.

TRANSFORMERS



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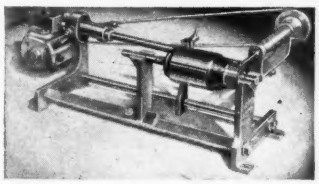

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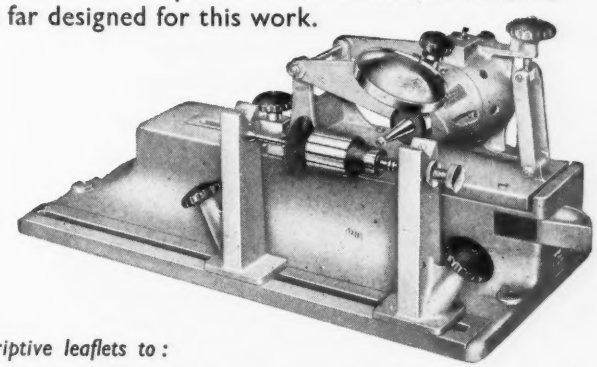

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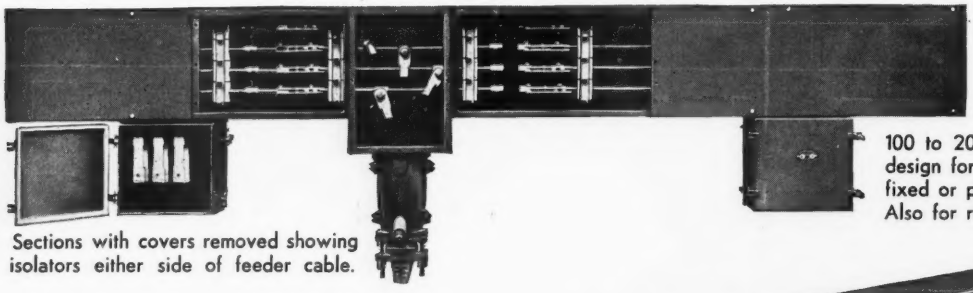

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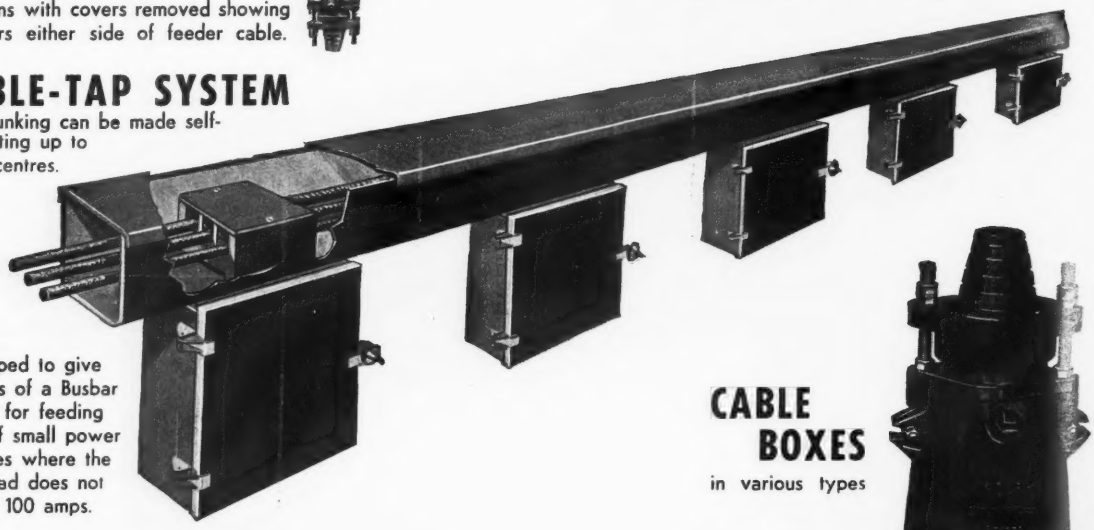

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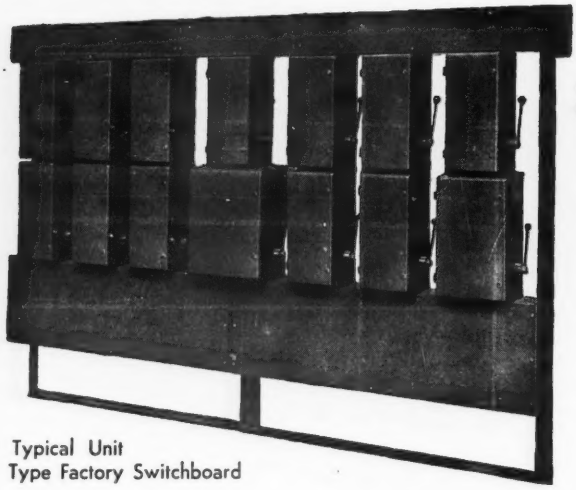

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Type Factory Switchboard

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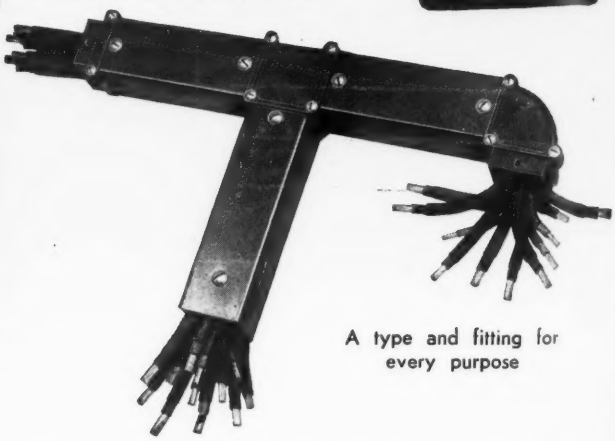

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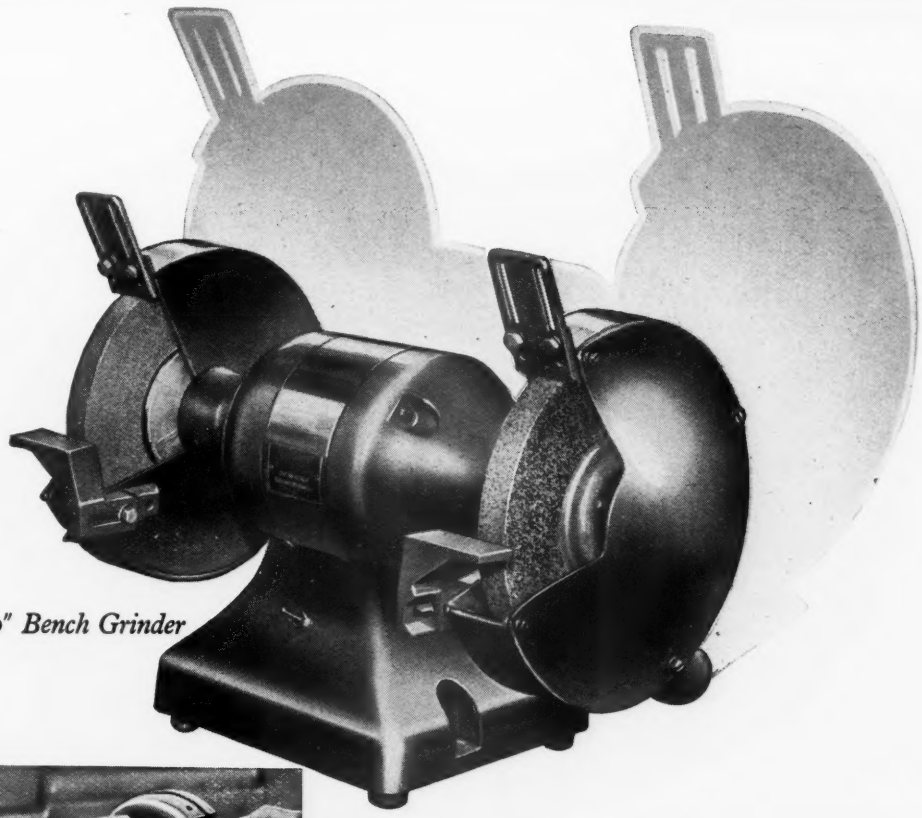

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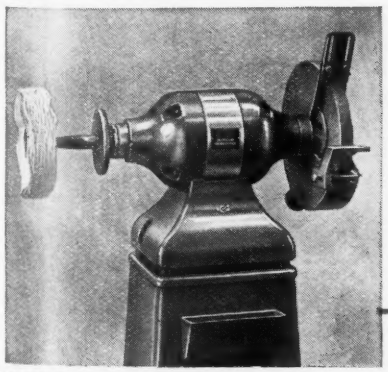

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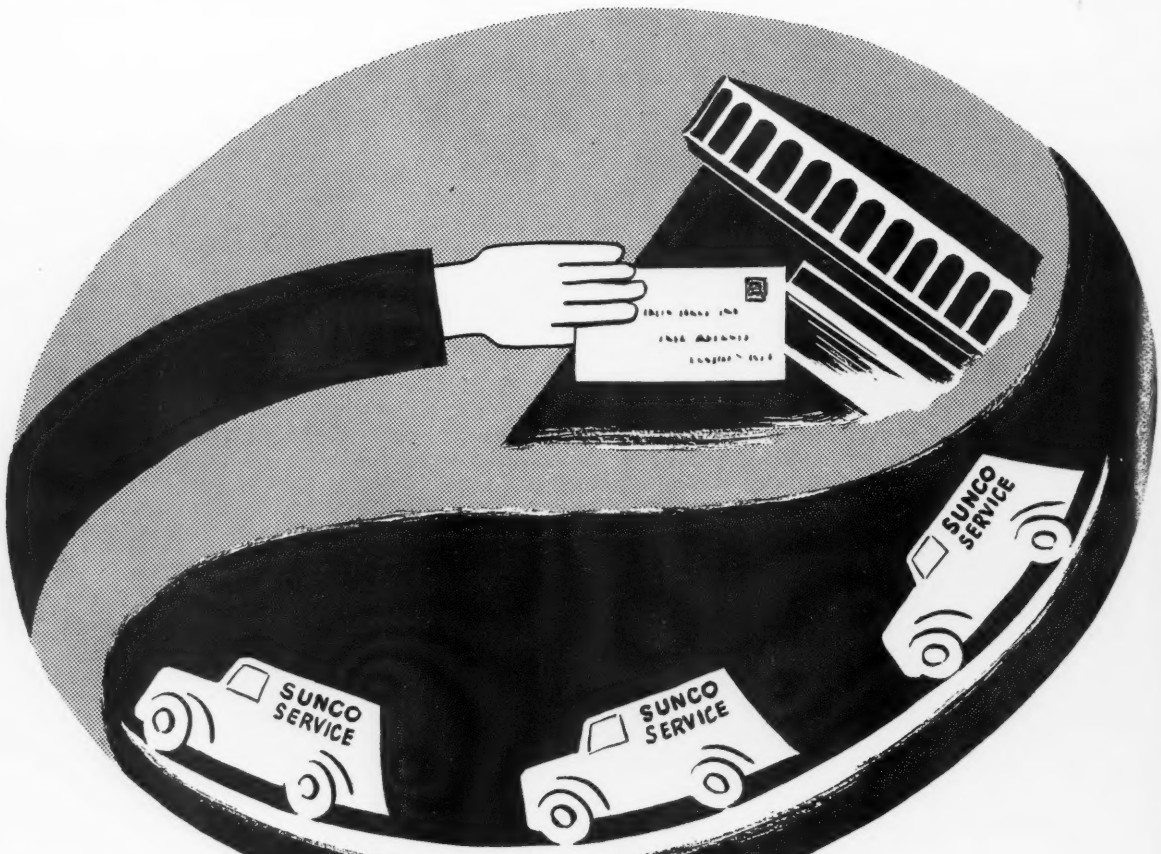

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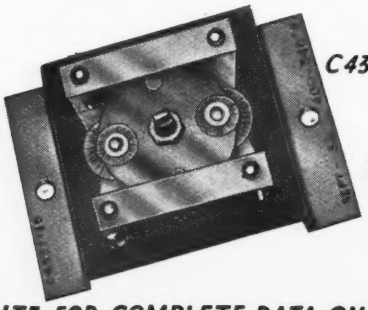

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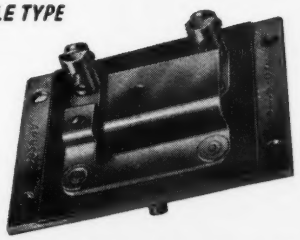

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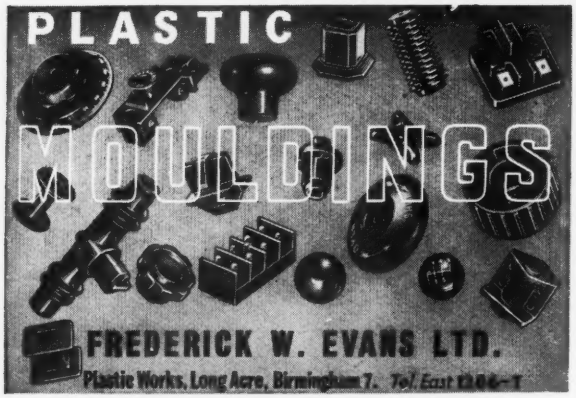

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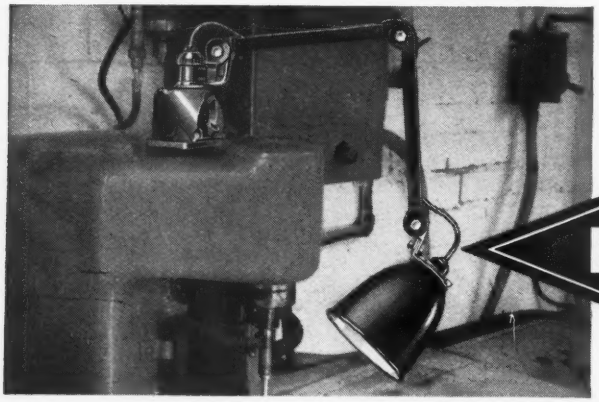

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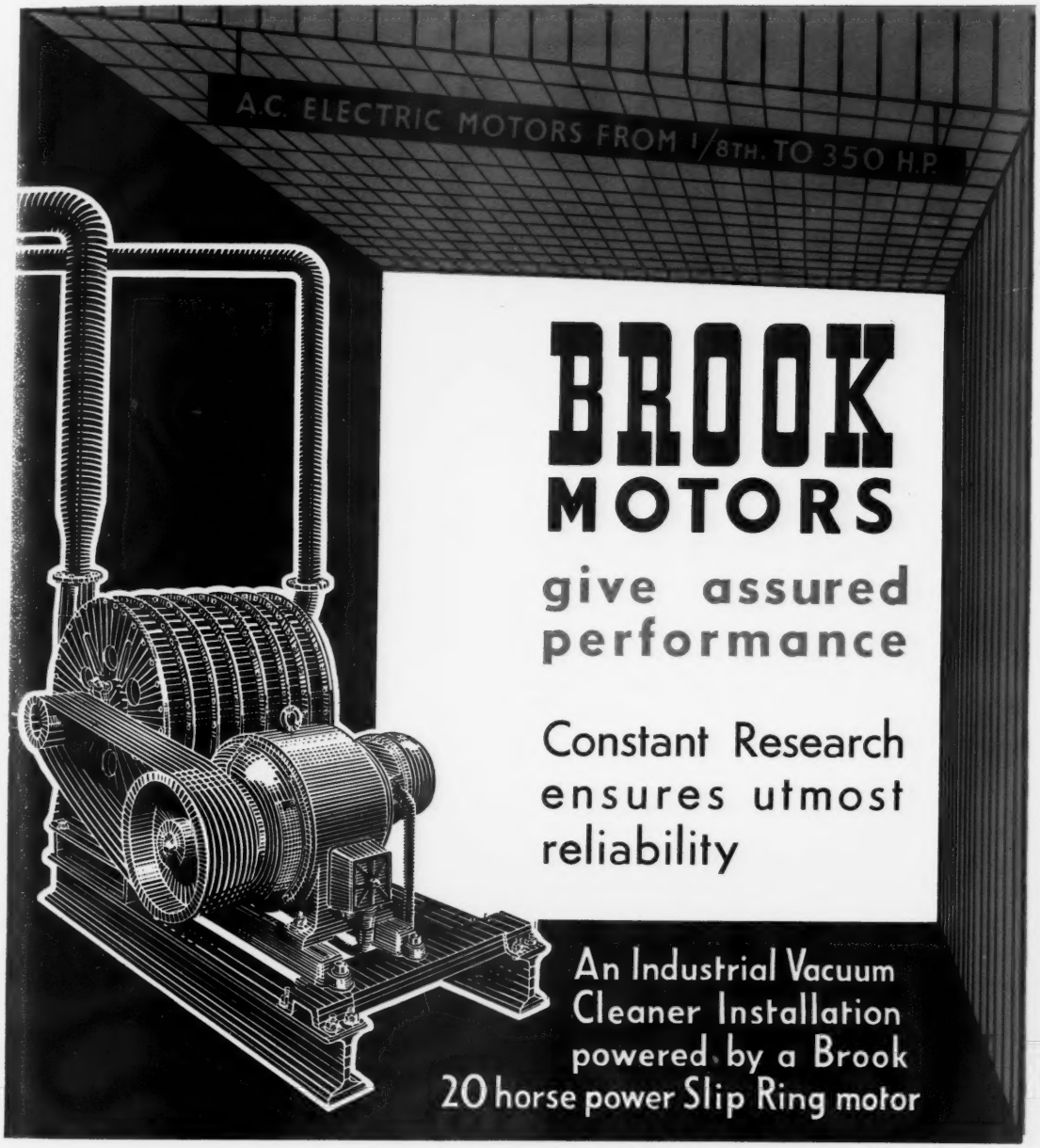
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Central concrete standards in Devonshire Place carry vertical-mounted fluorescent lighting.

At Eastbourne

Photographs by courtesy of South Eastern Electricity Board.

Illustrated above are two of the most recent lighting installations in Eastbourne. In South Street no lamp columns were used, the fluorescent lamps being attached to the buildings by special fitments. In Devonshire Place modern concrete columns have been centrally placed carrying vertical lanterns each with four 80W fluorescent lamps. Both installations are controlled, of course, by Venner Time Switches.

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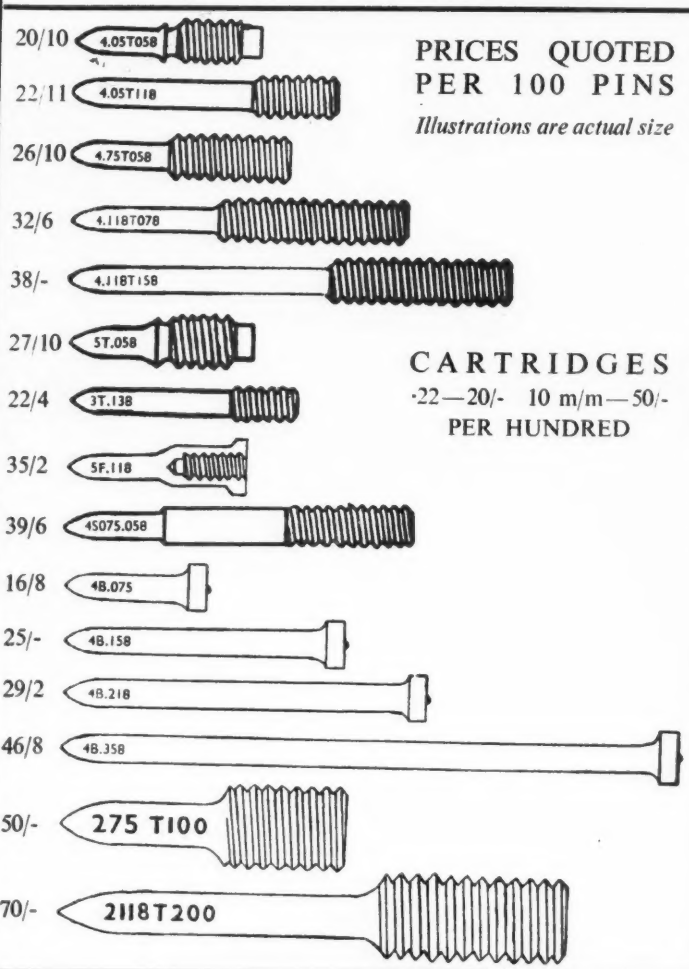

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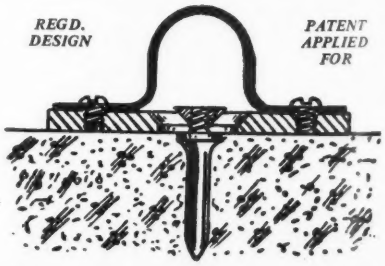

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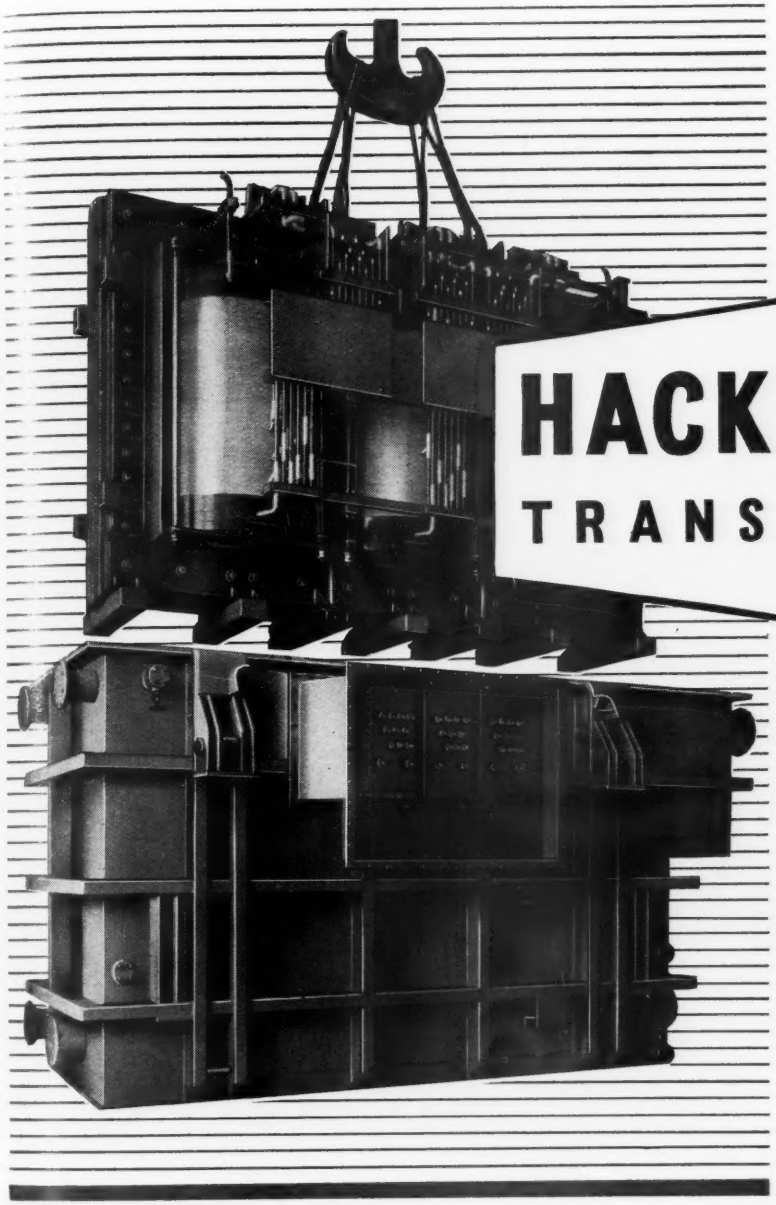

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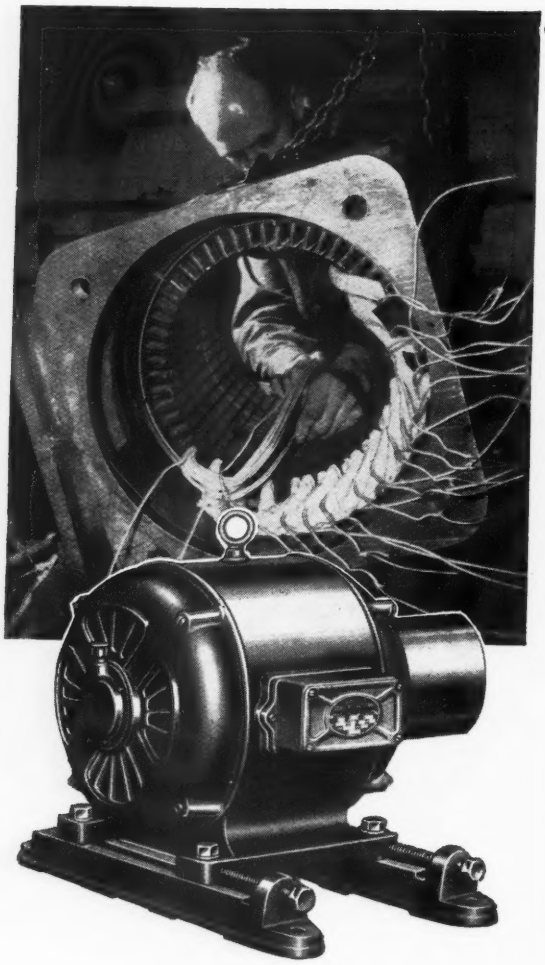

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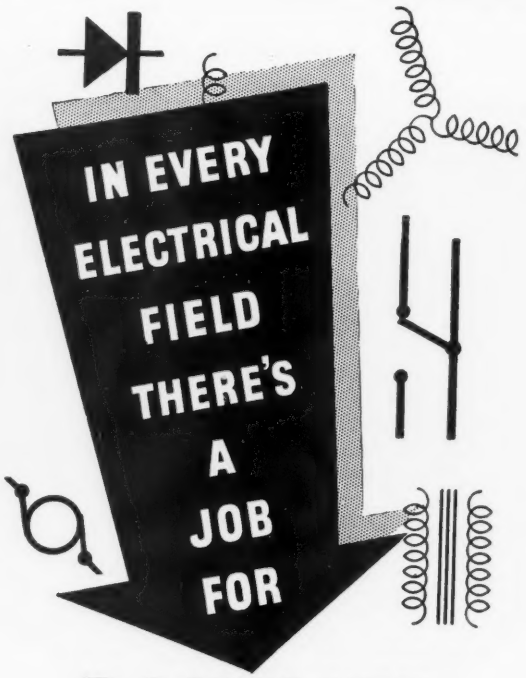

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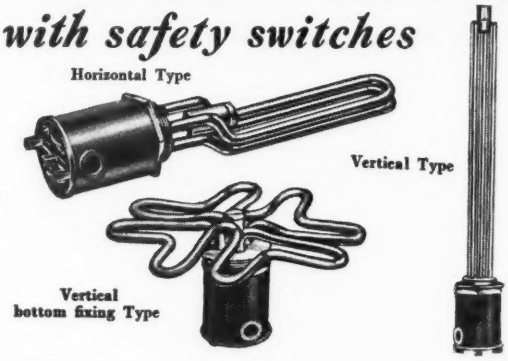

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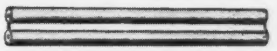
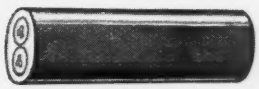


Fig. 8 section flexibles in P.V.C., or rubber insulation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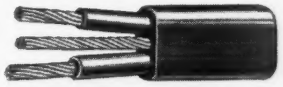
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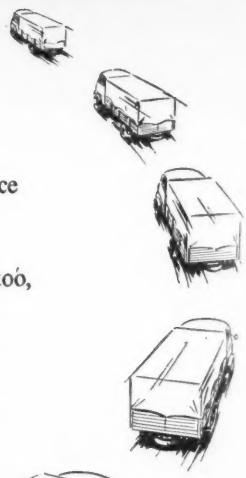

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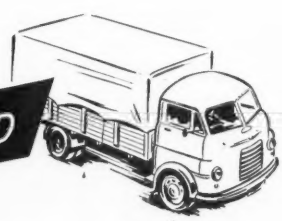

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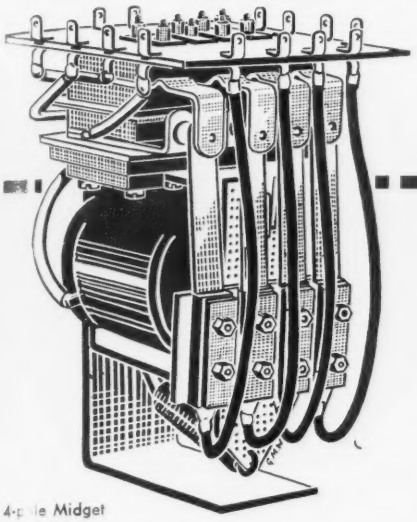

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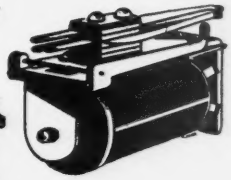

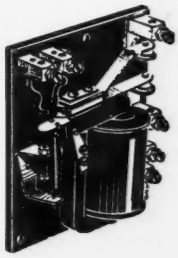

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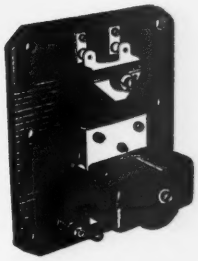

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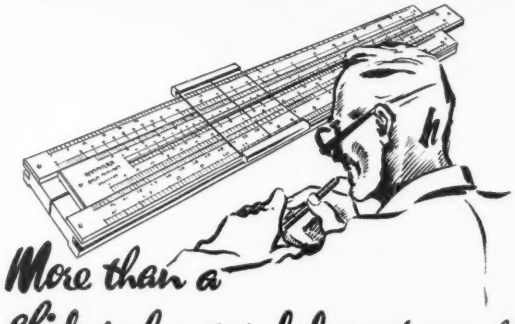

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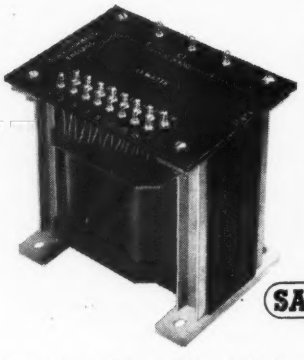

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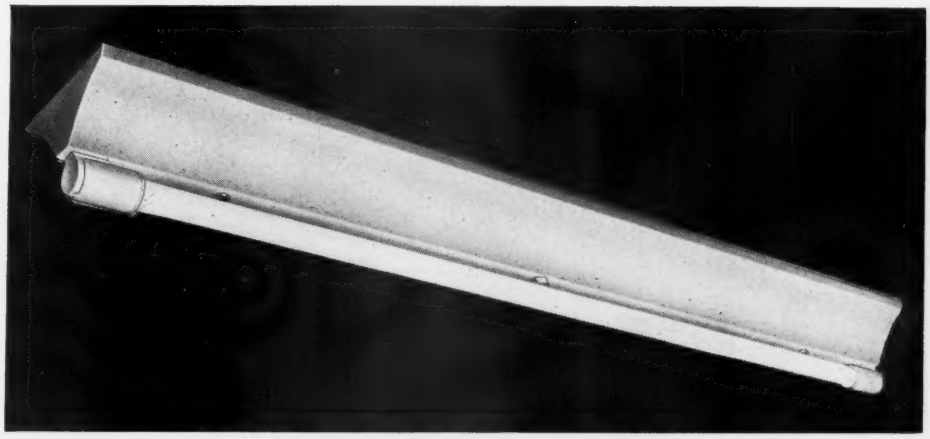

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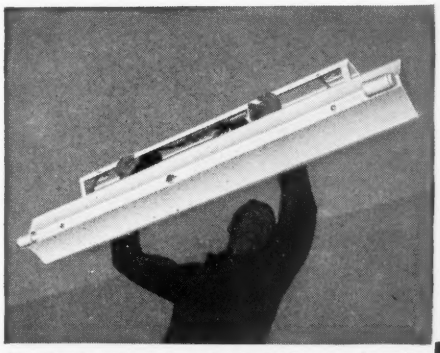

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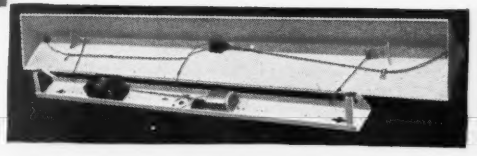

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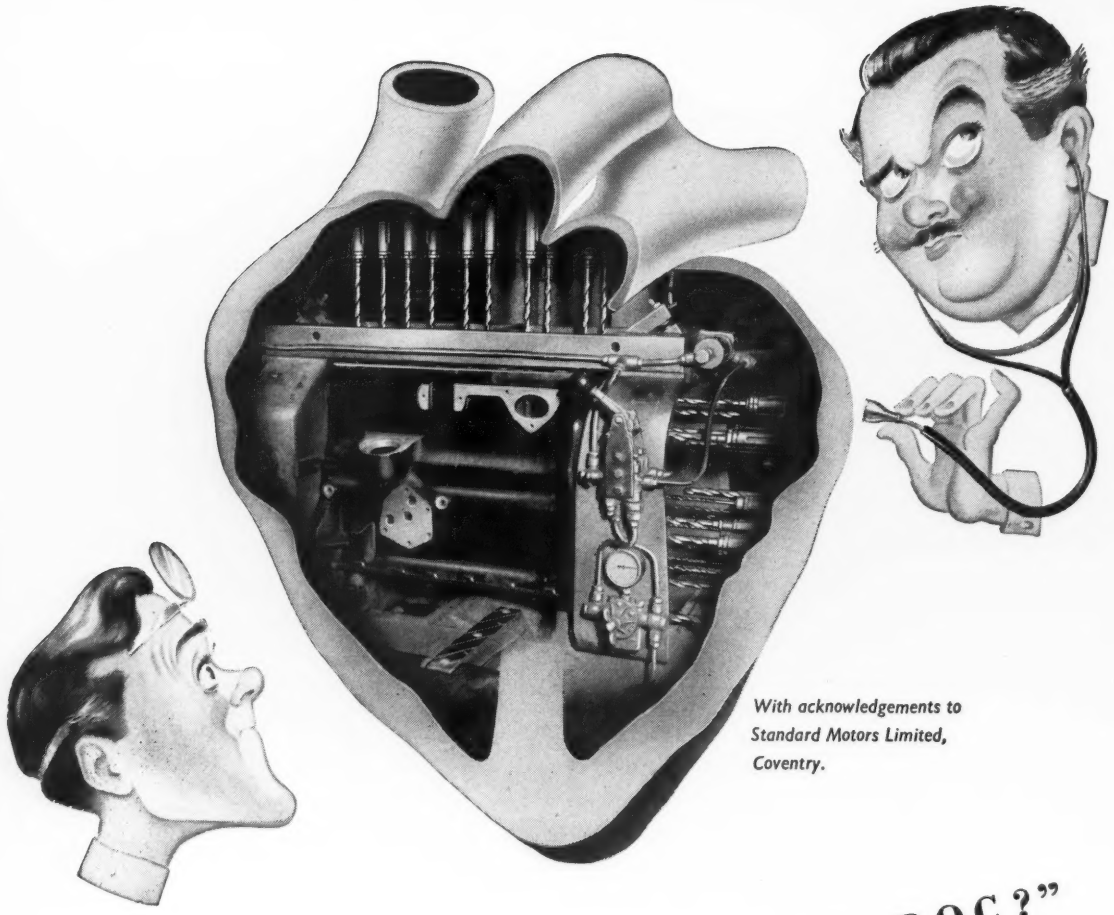

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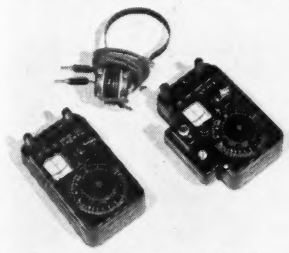

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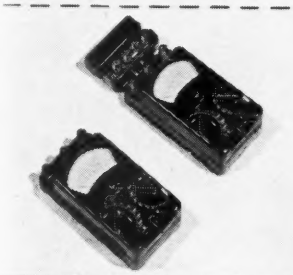

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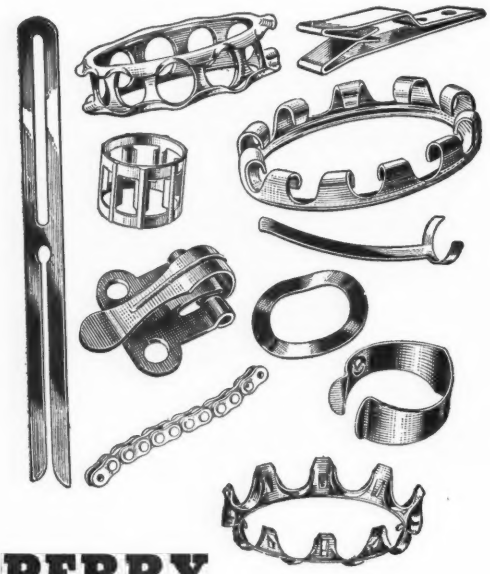

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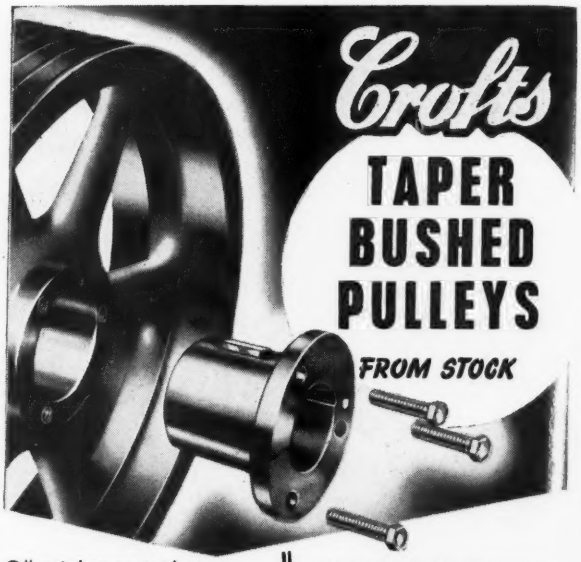

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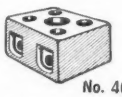

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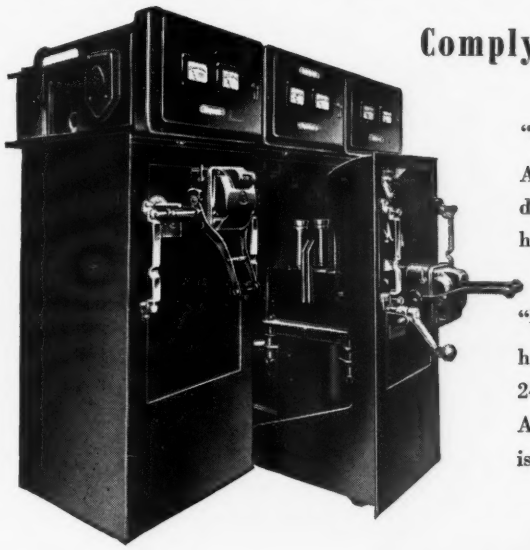

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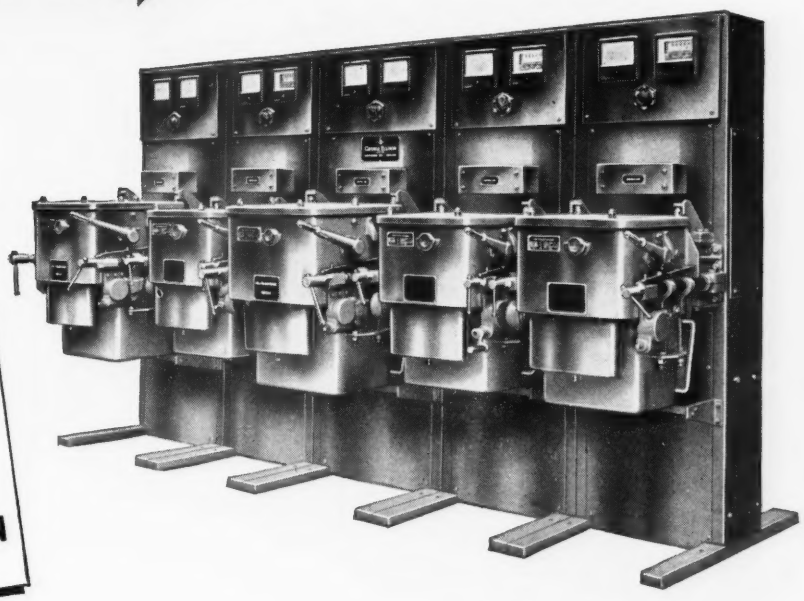

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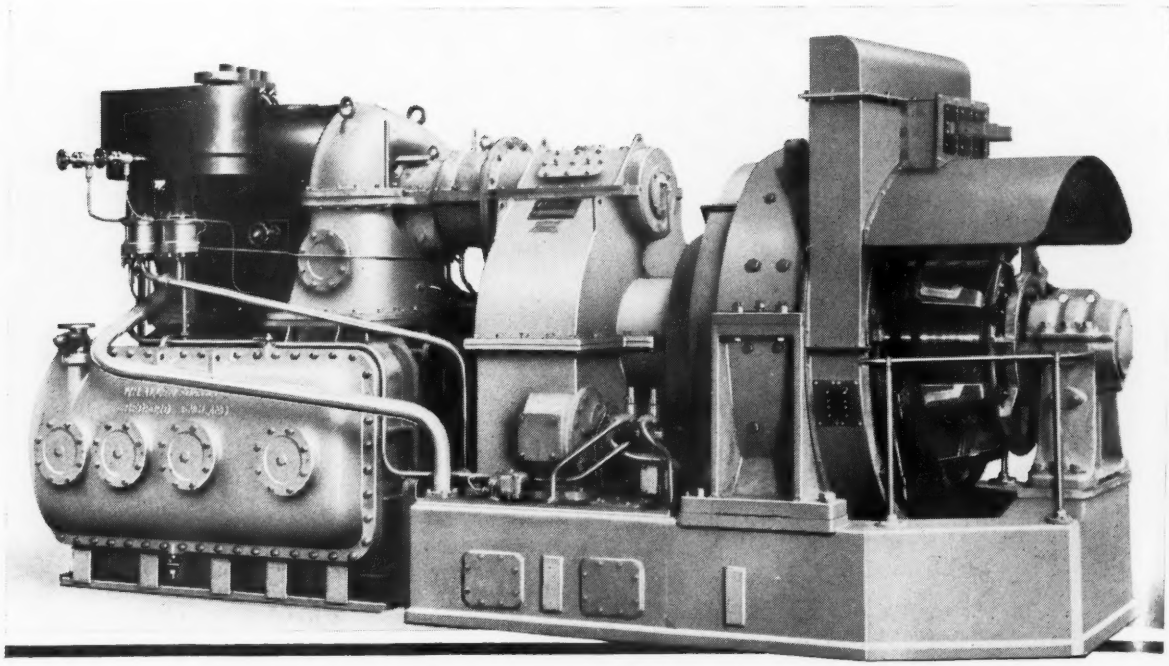

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for the 22,000-ton Cunard Liner "SAXONIA"

Built by John Brown & Co. (Clydebank) Ltd.

THE auxiliary steam and electricity requirements throughout the "SAXONIA", are supplied by four Allen self-contained pass-out turbo-generators, as illustrated above, each being capable of a normal full-load output of 750 kW at 225 volts, and arranged to pass out up to 20,000 lb. of steam per hour at 60 lb. per sq. in. gauge.

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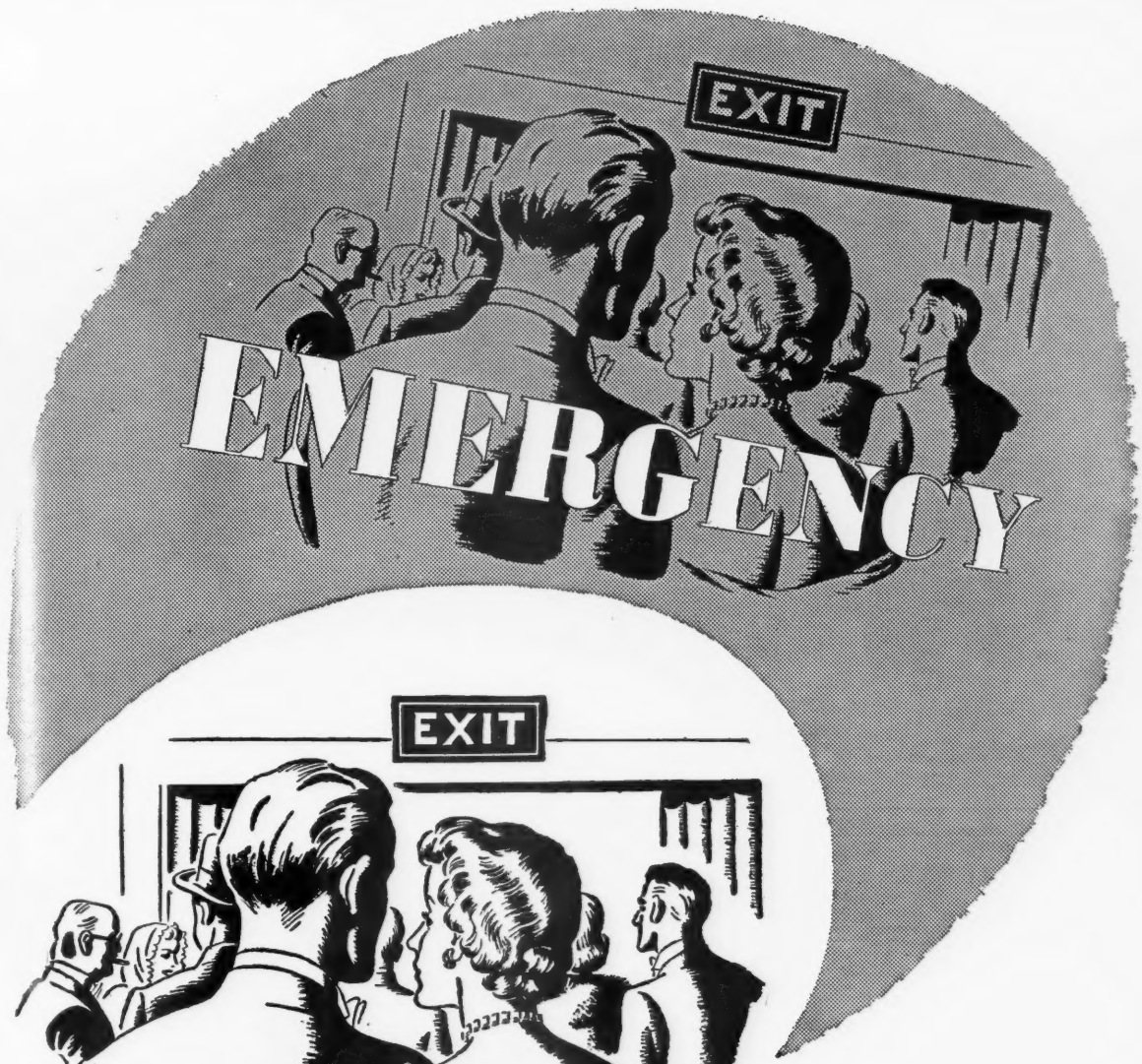

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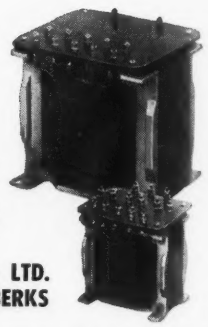

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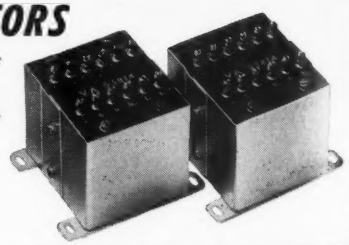

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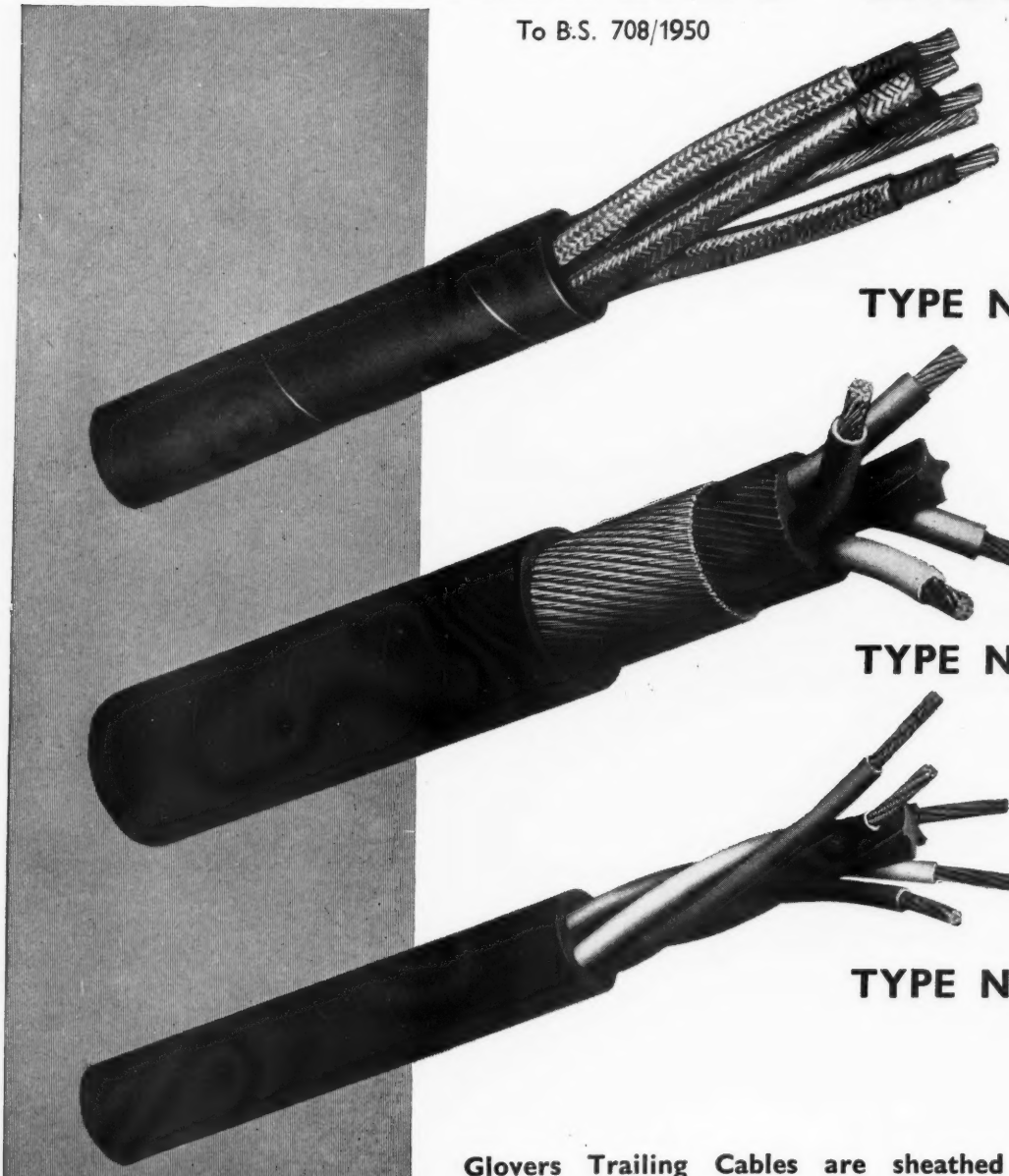

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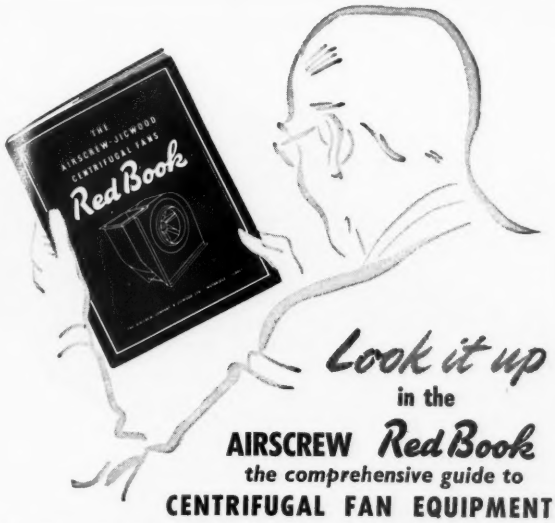

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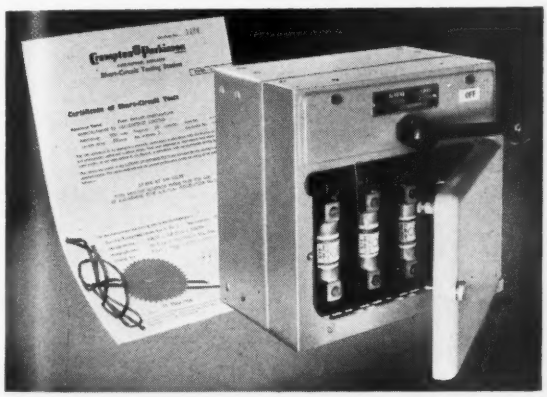

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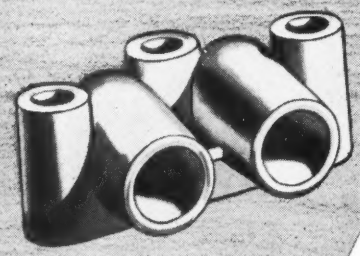

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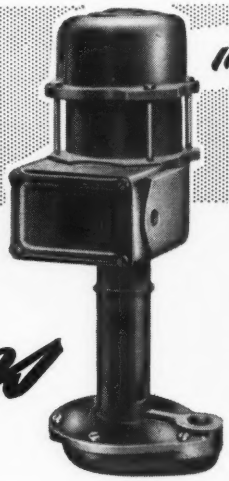

IMMERSED TYPE

IMMERSED TYPE WITH SWITCH

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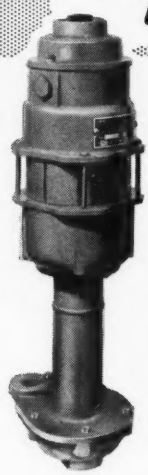

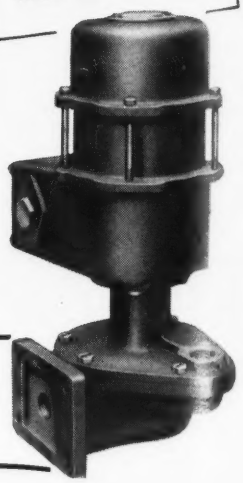

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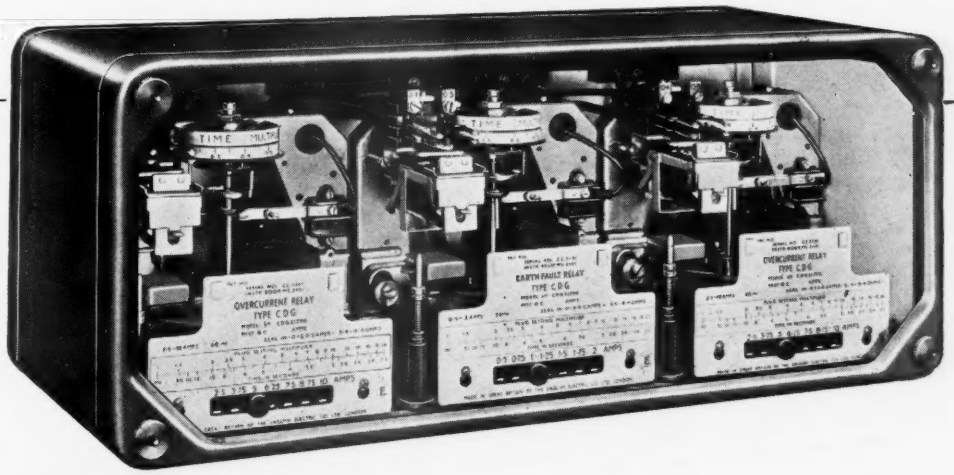

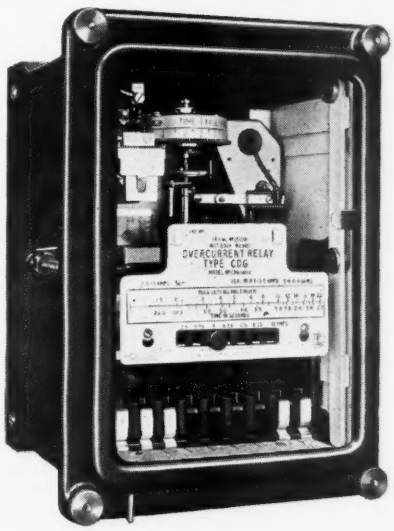

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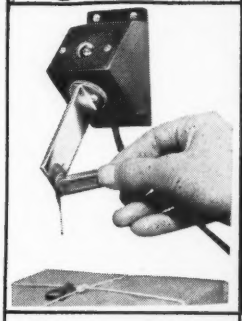

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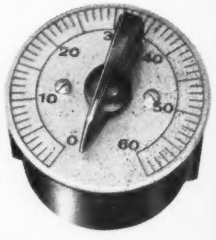

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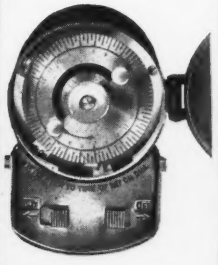

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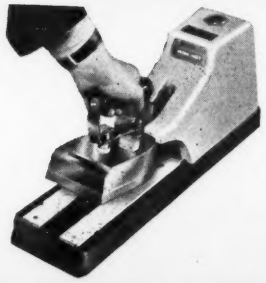

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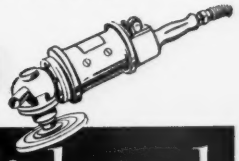

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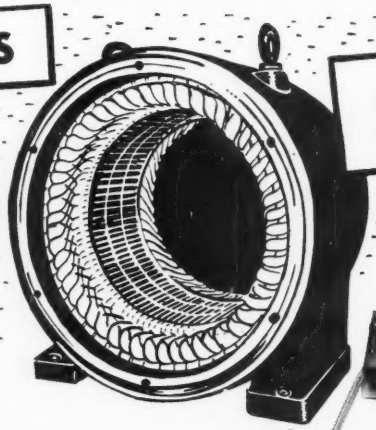

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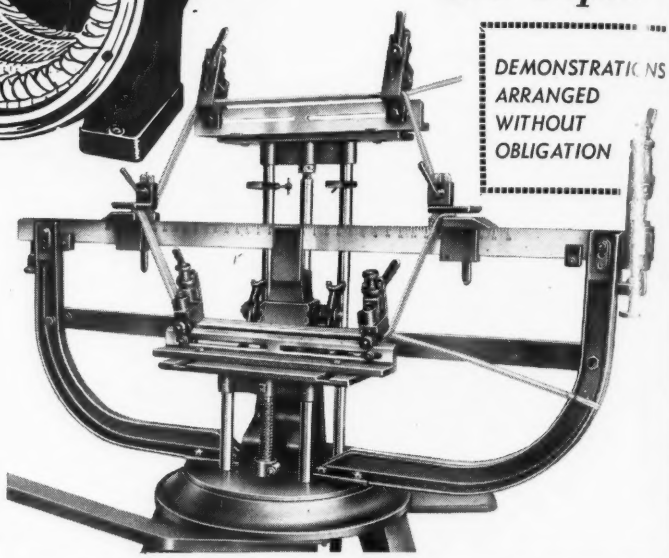

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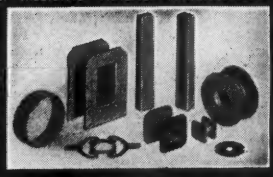

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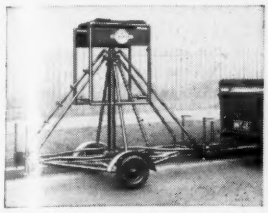
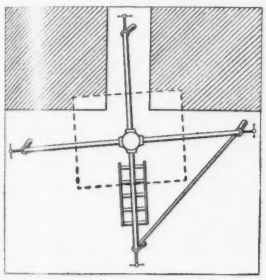
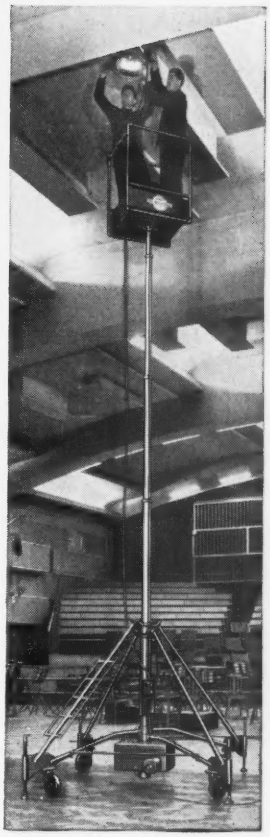
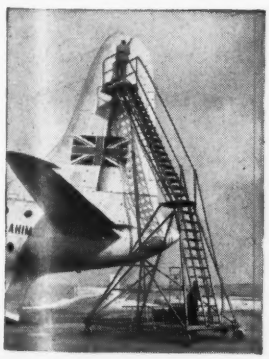




Above shows how "Beanstalk" (1) folds for passing through doorways, (2) can be trailer mounted, (3) gives close access with one leg of base placed in narrow recess between fixed objects.



Up in seconds, the "Beanstalk" provides a quick and easy answer to the problem of getting at work overhead. Ideal for building maintenance and electrical installation work.



The "Giraffe" is now standard equipment at many airports for servicing aircraft such as the Beverly, Boeing, Britannia, Canberra, Comet, Constellation, Dove, Javelin, S23 and S30 Flying Boats, Viscount, Victor, Valiant and York.

Remember this "flying spanner" symbol—the mark that means the most efficient answer to every problem of reaching work overhead.

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These unique access tools are enabling factories, warehouses, stores and other undertakings, private and public, to reduce the cost of all kinds of maintenance and installation work. They supersede timber towers, ladders, trestles, scaffolding and other cumbersome methods of getting at working heights above normal reach.

The 'BEANSTALK' *Regd.*

For working heights up to 30 ft. (or 35 ft. with special extension) the "Beanstalk" is the handiest, most versatile working platform ever designed. Hundreds are in use throughout industry and by municipalities and are repaying their cost many times over in convenience and saving of time and labour.

Raised and lowered by a telescopic hydraulic ram manually or electrically operated, the "Beanstalk" is sturdy and stable at all levels. Yet it can be instantly folded and wheeled by one man to any part of a building—through doorways, narrow passages and into lifts. Its base is designed to straddle fixed objects, allowing the platform to be placed close up to otherwise "awkward" spots.

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The 'SAFETY RAISER'

In the manufacture, repair and maintenance of large items such as aircraft or vehicles, the "Safety Raiser" has many valuable uses. Singly, it provides a working platform 6 ft. × 3 ft. (or larger) that can be adjusted by hand or electric pump for any working heights up to approximately 20 feet. Two or more placed at intervals can be bridged by staging. Bridging enables units to be used at varying levels to follow the differing heights of the work in hand.

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The system comprises bare copper busbars sheathed in a steel duct, and supplied in standard lengths with tapping points every two feet.

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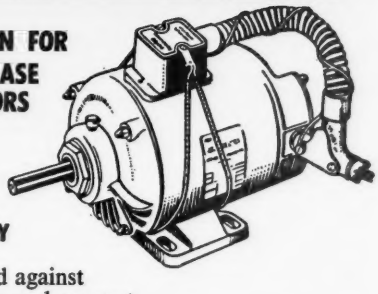
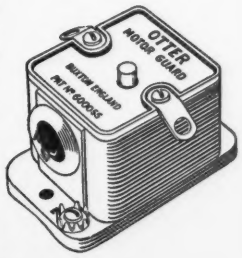


Otters guard against temperature and current overload, the starting current is carried by the thin Otter Bi-metal, which heats up more quickly than the motor windings. It cannot be fused.

List 21/7d.



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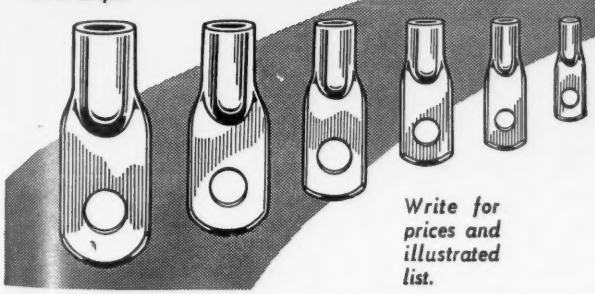

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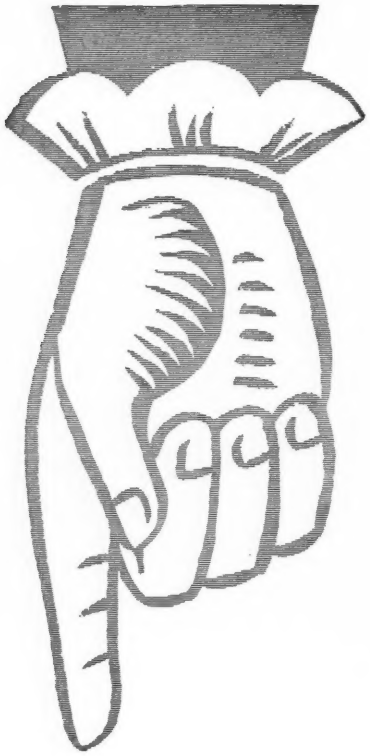

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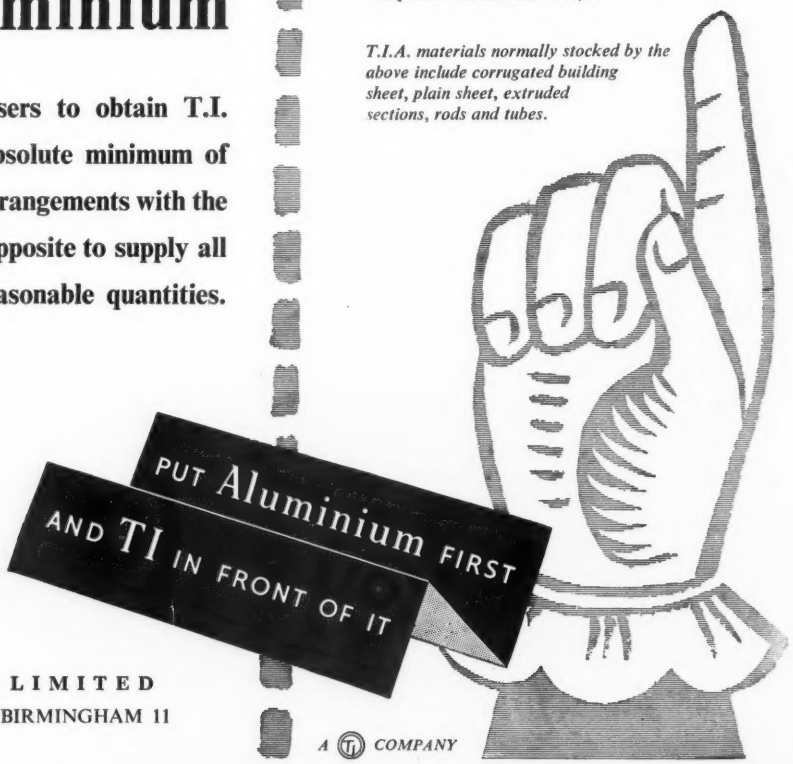
T.I.A. materials normally stocked by the above include corrugated building sheet, plain sheet, extruded sections, rods and tubes.



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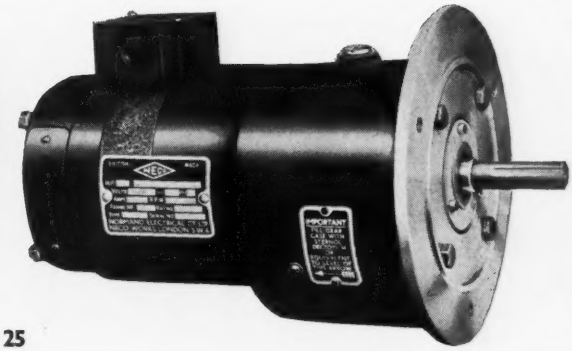

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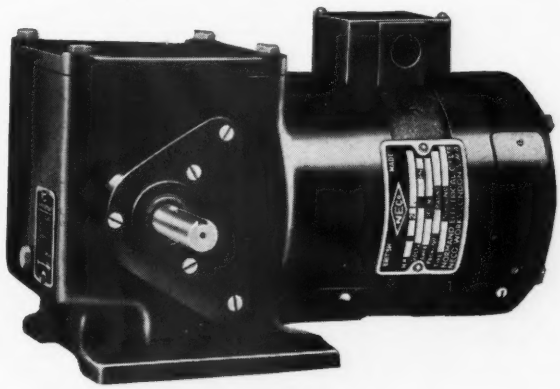
Type 25, in-line drive, and SW, right angle drive, have the same bolting plan and shaft height, and can be made to mount in any specified position, while Type 25 can also be flange mounted. $\frac{1}{8}$ H.P. motors, 3-phase s.c., 1-phase R.I., D.C., A.C. series, or Universal. Final speeds of Type 25 are between 312 and 0.079 r.p.m., and of SW 270 to 0.055 r.p.m., without a change of dimensions.

NECO geared motors with outputs up to 1500 lb.ft. NECO ungeared motors up to 5 H.P.



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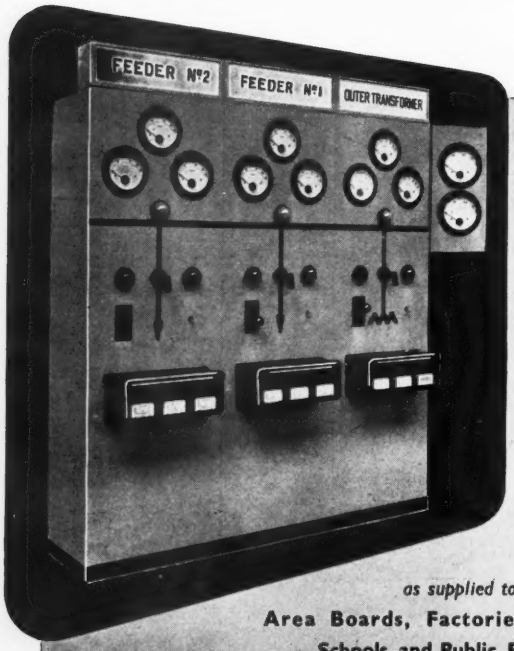

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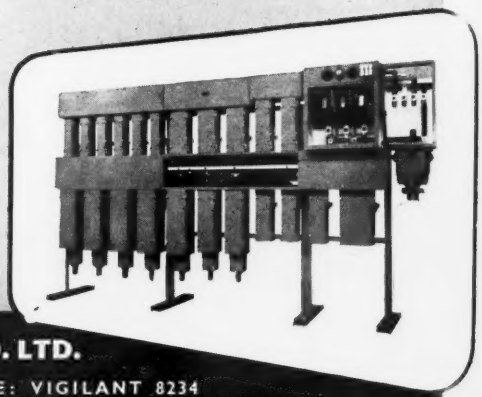

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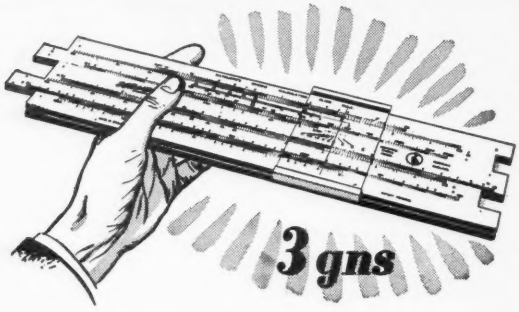

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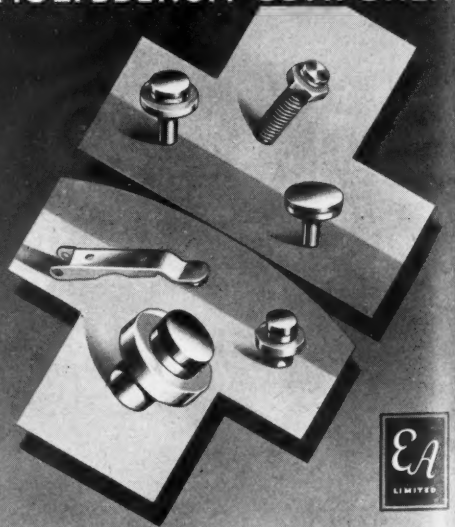

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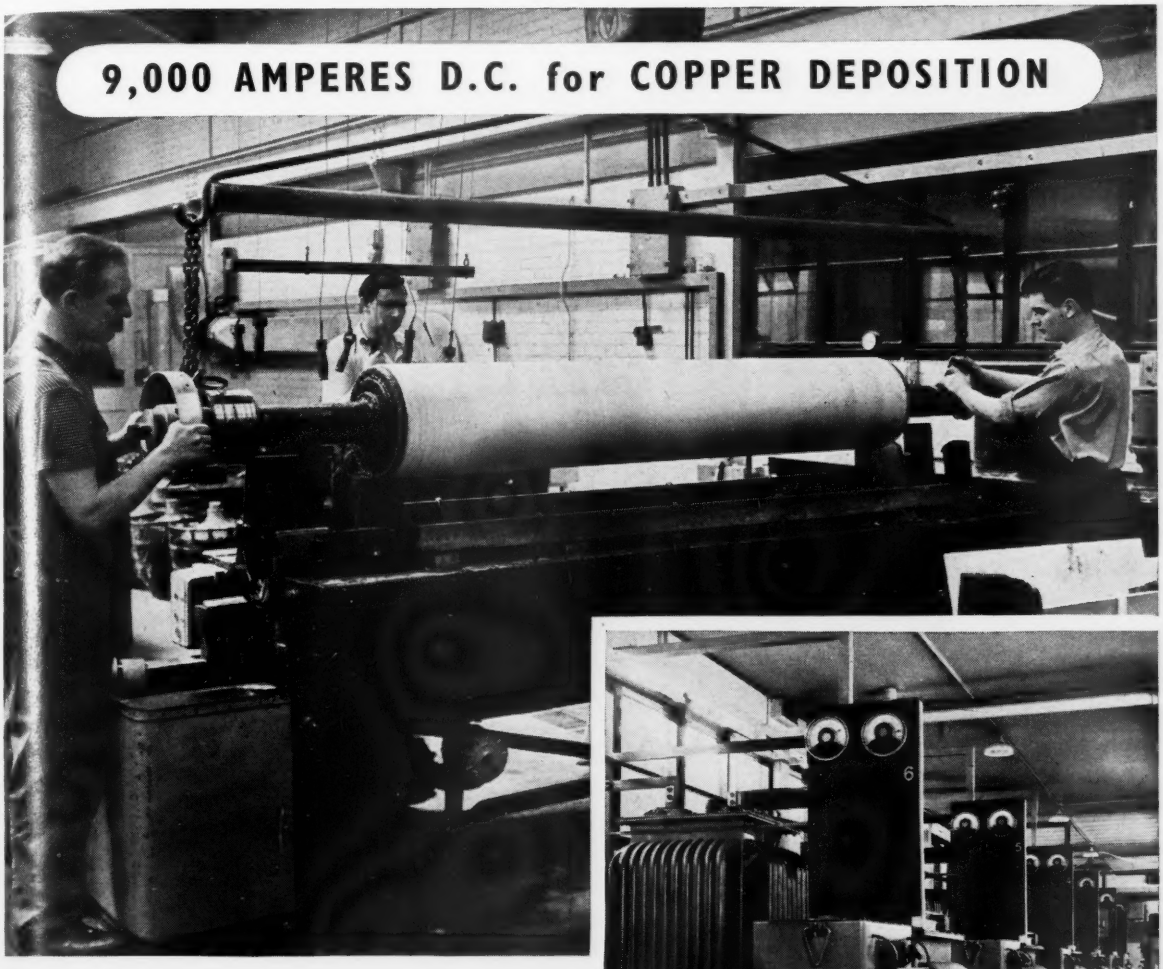

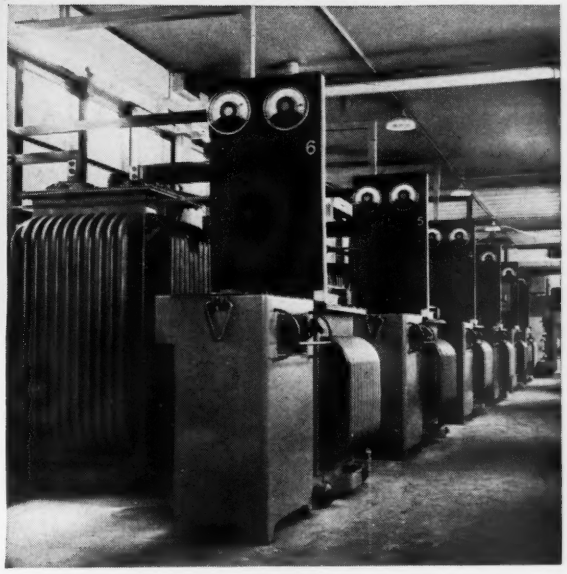

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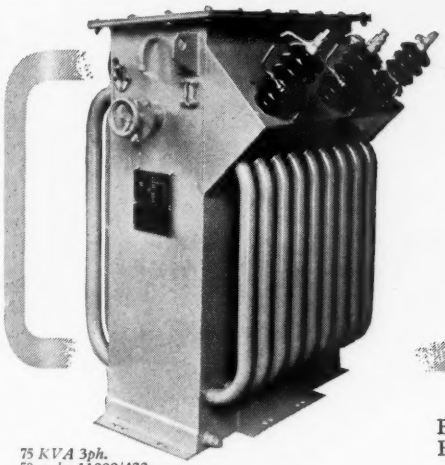
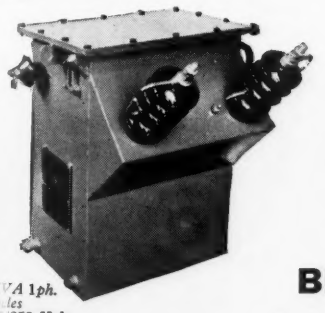


75 KVA 3ph. 50 cycles 11000/433-250 Volts Pole/Platform mounting



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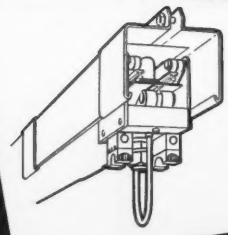
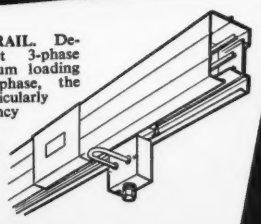
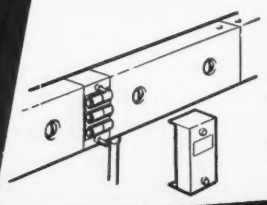


TROLLEY DUCT FEED RAIL. Consisting of one or more trolley collectors running on continuous conductor rails, the E.M.S. Trolley Duct avoids long, trailing leads on portable Tool installations, conveyor systems, moveable pendant lights, etc.

"UNIDUCT" FEED RAIL. Designed for 400 volt 3-phase supply, with a maximum loading of 100 amps per phase, the "Uniduct" is particularly suitable for high frequency tool installations on conveyor systems, small mobile cranes and hoists where bare conductors and trailing leads are dangerous.

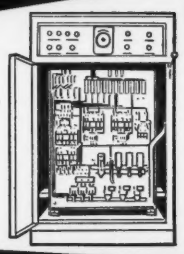


for industrial power users



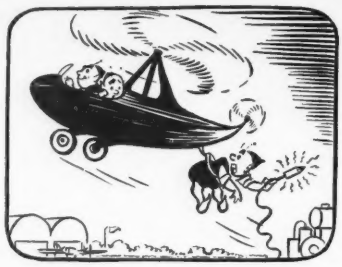
"MINIBUS" DISTRIBUTION SYSTEM. A miniature Busbar distribution system designed for small industrial installations where total loading does not exceed 100 amps per bar, and the load of each machine does not exceed 30 amps, available for 3-phase, 3- and 4-wire supplies.

CONTROL PANELS. This automatic control panel built for Imperial Chemical Industries illustrates the type of work we can undertake. Panels can be supplied complete or in skeleton form for building-in.



E.M.S ELECTRICAL PRODUCTS LTD

28, 32 THE BUTTS COVENTRY Tel. Coventry 61091 Grams Dispatch Coventry



THE "FLUXITE QUINS" AT WORK

"Come on, old chap, off we pack
We've FLUXITE, there's nothing we lack
We must leave OI behind
But perhaps he won't mind
He'll be finished before we get back."

Make a quick success of that soldering job – use Fluxite Paste. Suitable for all metals, except aluminium. Even solders and "tins" dirty metals!

And, remember, Fluxite "wipes" joints that other methods won't touch.

Used for generations in Government Works and by leading Engineers and Manufacturers. Of all Ironmongers in tins from 1/- upwards.

FLUXITE Regd.

SOLDERING PASTE

A STAUNCH COMPANION TO FLUXITE SOLDERING FLUID

Simplifies **ALL** *Soldering*

FLUXITE LTD BERMONDSEY ST · LONDON S·E·1

"Constat" CONTROLLERS

MODEL "MB"

STEM TYPE THERMOSTAT for control of IMMERSION HEATERS, PLATENS, DRYING OVENS, Etc.

Suitable for 15 amps, 250 V. A.C. only.

Standard Instrument 11" stem with ½" B.S.P. pocket.

Standard range 90/190° F and 30/90° C.

Other lengths and scales available

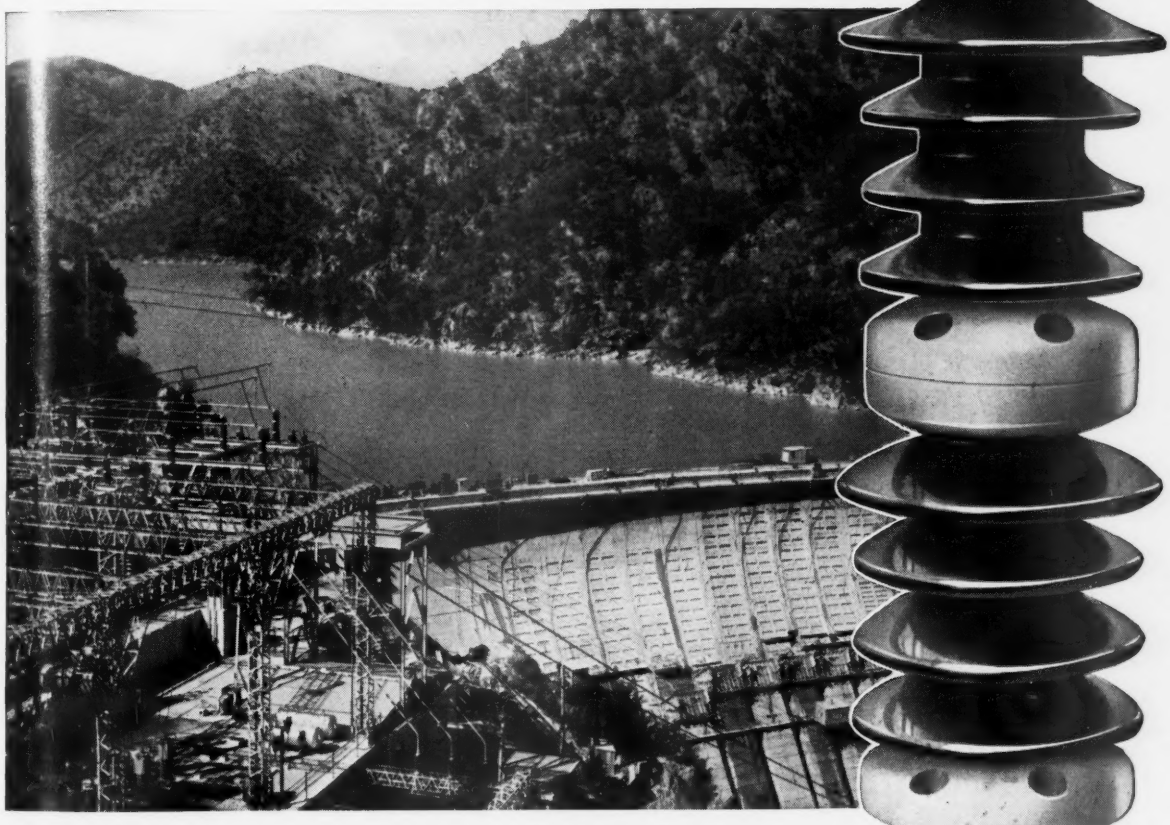
THE THERMOSTATIC CONTROLS Co

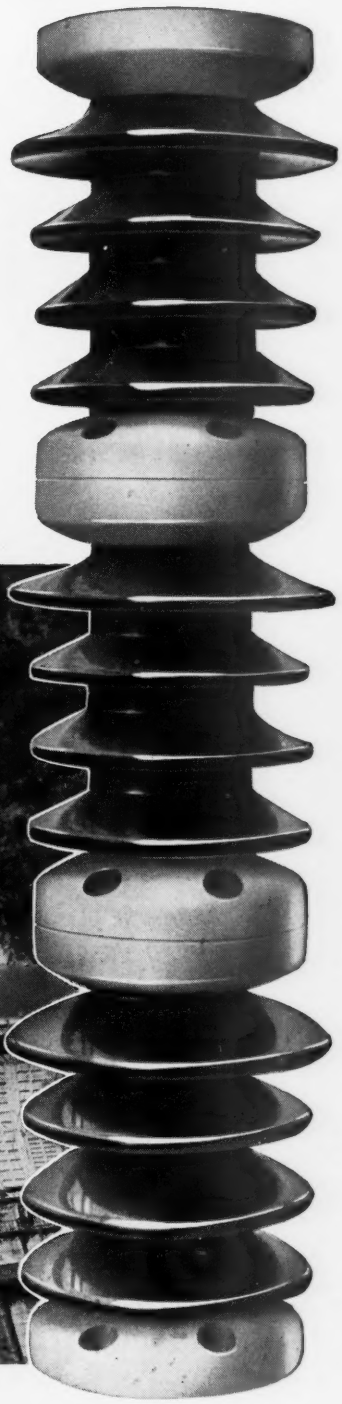
AVENUE ROAD·HAMPTON·MIDDX.

TELEPHONE: MOLESEY-3285/7

S.P.P. INSULATORS IN SERVICE

Cylindrical Post Insulators in New South Wales





The Burrinjuck 132 kV. switching station was equipped with Cylindrical Post Insulators type P.703. This is one of many stations on the New South Wales Public Works Department system equipped throughout with S.P.P. Post Insulators for 132 kV., 110 kV. and 66 kV.

STEATITE & PORCELAIN PRODUCTS LTD.

Stourport-on-Severn, Worcestershire. Telephone: Stourport 111. Telegrams: Steatain, Stourport

These advertisements are selling for you in the following publications:

News of the World, Sunday Pictorial, Sunday Express, Woman, Woman's Own, Good Housekeeping, Picture Post, Home Chat, Home & Country, Ideal Home, My Home, Wife & Home, Woman's Pictorial, Woman & Home, Woman's Weekly.

Just what I've always wanted!
So quick, so convenient, so economical, life's so much easier now that I have my 'Swan Brand' Kettle.
It's a happy family with a
SWAN BRAND
ELECTRIC KETTLE
From Leading Stores and Electrical Dealers
In the home for a LIFETIME
Write for illustrated literature to Bulpitt & Sons Ltd., Dept. HC, Birmingham 18
M-W.346
In the home for a LIFETIME
SWAN BRAND
Ground Base
ALUMINIUM HOLLOWARE
THE 1" FLAT BASE MAKES PERFECT CONTACT WITH HOT PLATE & CUTS CURRENT COSTS
Send for leaflet to Bulpitt & Sons Ltd. (Dept. NW), Birmingham 18
M-W.331R

Keep sales moving with

SWAN BRAND

ELECTRICAL APPLIANCES & GROUND BASE ALUMINIUM HOLLOWARE

BULPITT & SONS LTD., ST. GEORGE'S WORKS, ICKNIELD ST., BIRMINGHAM 18

M-W.347

FIRE RISK?
Get in touch with
KIDDE'S...yes, KIDDE'S...
WAXlow 1061!

PLANNED
FIRE PROTECTION
by SPECIALISTS

Telephone: WAXlow 1061

The WALTER KIDDE COMPANY LTD

BELVUE ROAD · NORTHOLT · MIDDLESEX

TRADE K MARK Kidde

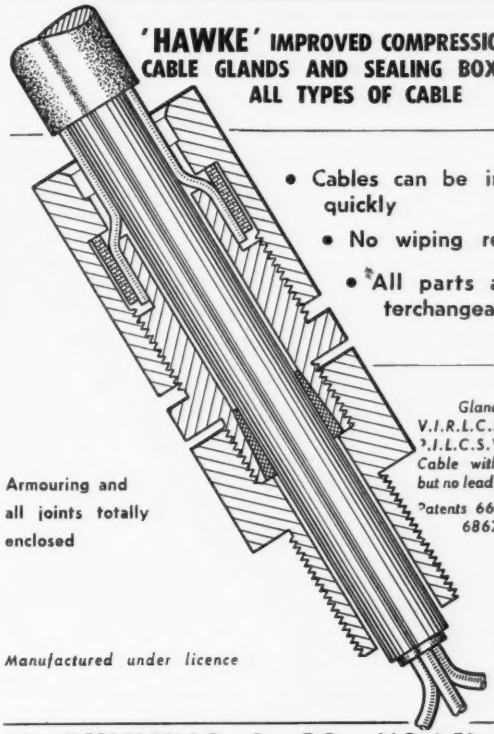
This **HELI-COIL** *insert*

. . will give you positive protection against wear, stripping and corrosion in all tapped threads. It permits cleaner, more functional design . . .

ARMSTRONG PATENTS CO. LTD.
BEVERLEY, YORKSHIRE Telephone: Beverley 410

I.B. D/100/C

'HAWKE' IMPROVED COMPRESSION TYPE CABLE GLANDS AND SEALING BOXES FOR ALL TYPES OF CABLE



- Cables can be installed quickly
- No wiping required
- All parts are interchangeable

Gland for V.I.R.L.C.S.W.A./s; P.I.L.C.S.W.A./s or Cable with D.W.A., but no lead sheathing.

Patents 666004 and 686299

Armouring and all joints totally enclosed

Manufactured under licence

Complies with B.S.S. 542-1947

H. DUNNING & CO. (1946) LTD
Stamford Road, AUDENSHAW, Nr. Manchester
Telephone: DENton 2828

THE AT BRASS

COMPRESSION GLAND

For use with V.I.R., T.R.S., Lead-covered and Armoured cables.

Gives a completely watertight joint. Bored to size, with lead compound packing washer to ensure perfect bond between lead sheath and gland body. Complete with heavy-gauge lock nut and armour clamp.

Makers of glands for all types of cables. May we look forward to your enquiries?

AUSTIN TAYLOR ELECTRICAL LTD.

ELLESMERE ST. • FAILSWORTH • MANCHESTER

Telephone and Telegrams: FAILSWORTH 3246

CW 1977/141

IT'S NEW!

It's SCEMCO

PLASTIC LOUVERING

No limit to louvering areas, and delivered in easily assembled sections. It can be cut to any shape.

Beautifies and attracts with its very modern concealed lighting effect.

- *Light, rigid, attractive*
- *Does not tarnish*
- *Easy to fix*
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No limit to size available
— for use with Scemco fittings

Send us the measurements — we do the rest . . .

SCEMCO LIMITED

ENGLAND'S LEADING FLUORESCENT LIGHTING SPECIALISTS.

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CHINA CONNECTORS

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ONE, TWO AND THREE WAY
5 AMP.– 15 AMP.– 30 AMP.

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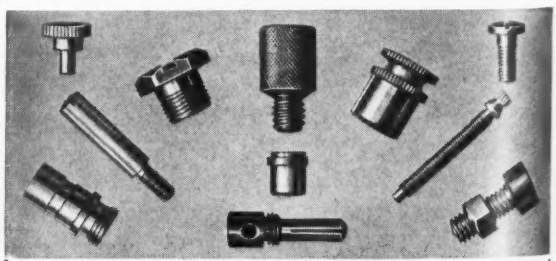
FOR DETAILS, ASK FOR OUR CATALOGUE No. OHL/31/ER

METWAY ELECTRICAL INDUSTRIES LTD.

Metway Works
CANNING STREET
BRIGHTON, 7

Phone: Brighton 28366 Grams: 'Metway Phone Brighton'



Keen Prices Prompt Delivery

ELECTRICAL SCREW LTD

Belfast Road, Stoke Newington, N.16

A load off your mind when you instal

METROVICK

TYPE NF Watt-hour Meters

The demand for more accurate metering over today's extended load ranges has led to the development of the Type NF meter which offers the following important features :

- *High degree of accuracy over wide range of loads*
- *Complete temperature compensation*
- *Damping system giving complete stability*
- *Simple and accessible adjustments for calibration*
- *Easy dismantling for maintenance*
- *One terminal block for all capacities*

Please write for leaflet 356/10-1

Visit our stands
Nos. 3, 4 & 5, Avenue P
Scottish Industries
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ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the A.E.I. group of companies

Wings Day SEPT 18 Give for those who Care

For Meticulous Metering

G/A405

RING MAIN UNITS by G.E.C.

- For ratings up to and including 250 MVA at 11 kV.
- Outgoing feeder controlled by a standard metalclad oil circuit breaker.
- Fault-making oil switches.
- Simple, robust and comprehensive system of interlocking.
- Available in extensible and non-extensible form.

THE GENERAL ELECTRIC CO., LTD. MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a **Box Number** this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

AUSTRALIA

SNOWY MOUNTAINS HYDRO-ELECTRIC AUTHORITY

TENDERS are invited for the Manufacture, Testing, Supply, Delivery to Site, Supervision of Erection, Commissioning and Maintenance of:—

SEVEN 56 MVA, SINGLE-PHASE TRANSFORMERS AND ANCILLARY EQUIPMENT TO CONTRACT NO. 40,006

Copies of Tender Documents at a cost of £1 per set are now available at the following addresses:—

Stores & Supply Branch, Goulburn Street, Sydney, N.S.W., Australia.

Stores & Supply Branch, Head Office, Cooma, N.S.W., Australia.

Branch Office, 250, Flinders Street, Melbourne, C.1, Victoria, Australia.

Authority's Representative, Melbourne Building, Civic Centre, Canberra, A.C.T., Australia.

The Authority shall not be bound to accept the lowest or any Tender.

Tenders for the above Contract must be submitted in DUPLICATE in accordance with the Conditions of Tendering, enclosed in a sealed envelope, appropriately endorsed, and addressed to:—

SNOWY MOUNTAINS HYDRO-ELECTRIC AUTHORITY

and should be lodged in the Authority's Tender Box at their office in Goulburn Street, Sydney, N.S.W., Australia, or posted in time to reach Box No. 4,900, G.P.O. Sydney, N.S.W., Australia, on or before 10 a.m. 14th December, 1954.

W. HUDSON,
Commissioner.

4925

CITY OF NORWICH

Sewage Disposal Works, Whitlingham

Electrical Contract (Contract No. 2)

TENDERS are invited for the supply and installation of electrical switchgear cables and accessories at the above works.

Drawings and general conditions of contract may be inspected at, and specification and bill of quantities obtained from, the City Engineer on payment of 2 guineas which will be returned upon receipt of a bona fide tender and all documents supplied.

Tenders in plain sealed envelopes endorsed "Electrical Contract" are to be delivered to the undersigned on or before Friday, 24th September, 1954.

H. C. ROWLEY, M.I.C.E.,
City Engineer.

City Hall,
Norwich.
September, 1954. 4986

INDIA STORE DEPARTMENT

DIRECTOR-GENERAL, Supplies and Disposals, New Delhi, invites tenders for supply of 8 Portable Diesel-electric Generating Sets, minimum capacity 22 kVA and 37 kVA.

Please apply for official tender forms to Director-General, India Store Department, 32/44, Edgware Road, London, W.2, with remittance of twelve shillings in favour of the High Commissioner for India, quoting reference S.2017/54.

Tenders are due to be returned direct to New Delhi on or before 29th September, 1954. 4992

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

NORTH WESTERN GAS BOARD

North Cheshire Group

Electrical Superintendent, Denton New Works

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T. 9 (£635-£735 per annum).

Applicants should have experience in the operation and maintenance of electrical equipment on a gas works, including 1,200 kW turbo-alternators, 6.6 kV, 3.3 kV and 446 v. distribution systems, electric motors and starters up to 500 h.p.

Detailed applications, giving the names of two referees, should reach the General Manager, North Western Gas Board (North Cheshire Group), Gas Works, Portwood, Stockport, within fourteen days. 4937

SOUTH EASTERN METROPOLITAN REGIONAL HOSPITAL BOARD

A POST of PRINCIPAL ASSISTANT ENGINEER (Scale 1) (Salary £1,100 × £40 to £1,300) having fallen vacant, the Board will make an appointment either to this post or to the already advertised post of Senior Assistant Engineer (Salary £915 × £30 to £1,075) according to qualifications. Applicants, who should apply to the Secretary at 11, Portland Place, London, W.1, within 10 days, must be Corporate Members of the Institution of Civil or Mechanical or Electrical Engineers with experience in preparation of mechanical and electrical schemes, preferably but not essentially in hospitals, and should state age, present salary, etc., and names of two referees. Superannuable. 4940

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

SHEFFIELD SOUTH DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER. Applicants must have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, with training and experience fitting them to take charge of substation and mains construction, operation and maintenance work in a heavy industrial and densely developed residential area surrounded by a rural area in which are 33-kV and L.V. underground and overhead systems of electricity mains. The successful candidate will be expected to take personal charge of the more responsible construction and maintenance work on the 11-kV and L.V. systems in the district.

Salary N.J.B. Class H, Grade 7, £772/£802 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 23rd September, 1954.

No. 4 (Leeds) Sub-Area

JOINTERS (E.H.T.). Applicants must be first-class craftsmen and have experience in all types of joints and boxes on L.V., 6.6-kV and 11-kV systems. Experience on 33-kV joints and terminations will be an additional advantage.

Rate of pay 3s. 9d. per hour and conditions in accordance with the N.J.I.C. Agreement.

Applications, stating age, and giving full details of experience, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 17th September, 1954.

No. 1 (Bradford) Sub-Area

KEIGHLEY DISTRICT
CONSUMERS' ENGINEER. Applicants should be Corporate Members of the Institution of Electrical Engineers or hold qualifications leading to such membership, and must have had a sound training with subsequent experience in the work of a Consumers' Department in an Electricity Undertaking.

Details should be given of experience in the following matters:—

Negotiations with consumers requiring electricity supplies, tariffs, sales development, application of I.E.E. wiring regulations and other relevant regulations in testing and inspecting consumers' installations, electrical installation work, including preparation of specifications and tenders, repair to electrical apparatus, control of staff and workpeople.

Salary N.J.B. Class E, Grade 8, £619/£629 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 23rd September, 1954. 4960

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

SHIFT CHARGE ENGINEER required for Dunfermline Power Station.

Applicants should preferably have experience in operation of turbo-generators, water tube boilers and H.T. electrical plant. A knowledge of alternating current is advisable. Certificated marine engineers would be considered.

Salary £599-£622 (N.J.B. Class C/7). Pension scheme.

Apply in writing by 25th September, 1954, stating age and experience, to Divisional Controller, British Electricity House, Portobello, Midlothian. 4936

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

DRAUGHTSMAN Transmission Department, Divisional Headquarters (Vacancy No. 140/54/ER.). A Draughtsman is required in the Transmission Department at this Divisional Headquarters. Experience on the design and construction of H.V. substations or overhead transmission lines an advantage.

Salary in accordance with Schedule D of the National Joint Board Agreement, Grade 6 (£433-£567 per annum) for Engineering Draughtsman or Grade 5 (£567-671 per annum) for Senior Draughtsman, according to experience and ability.

Closing date for receipt of applications 21st September, 1954.

GENERAL ASSISTANT ENGINEER, Technical Department, Div. H.Q. (Vacancy No. 139/54/ER.). The minimum technical qualification required is the Higher National Certificate in Electrical Engineering. Preference will be given to candidates who have completed a recognised post graduate apprenticeship and experience of high voltage switchgear and protective gear will be an advantage.

The successful candidate will be required to reside in or near Leicester.

The salary will be in accordance with Schedule C, Class AX/DX, Grade 8 (£501-£694 per annum) of the National Joint Board Agreement. The commencing salary will depend on qualifications and experience.

Closing date for receipt of applications 21st September, 1954.

ASSISTANT MAINTENANCE ENGINEER (Electrical), Coventry Power Station (Vacancy No. 141/54/ER.). Applicants should have received a thorough technical and practical training with experience in testing protective gear, maintenance of alternators, transformers, switchgear and associated equipment.

Preference will be given to candidates who are Associate Members of a recognised Institution or possess similar qualifications.

Salary will be in accordance with Class G, Grade 8 (£678-£704 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 28th September, 1954.

ASSISTANT SHIFT CHARGE ENGINEER, Northampton Power Station (Vacancy No. 142/54/ER.). Applicants should have had a sound technical training and be experienced in the operation of modern steam power stations. They should preferably hold a Higher National Certificate in Electrical or Mechanical Engineering.

The salary for the appointment will be in accordance with Class G, Grade 9 (£641-£667 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 28th September, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller. 5004

IMPERIAL COLLEGE

APPLICATIONS are invited for post of LECTURER IN ELECTRICAL ENGINEERING. Salary scale £600 × £50 to £900; £50 to £1,150. F.S.S.U. and family allowances. Candidates should possess a good honours degree in electrical engineering and preferably have completed a Graduate Apprenticeship. Initial salary, according to experience and qualifications, will be at the lower end of the salary scale.

Applications, stating age, academic qualifications and experience, together with the names of two referees, should reach the Head of the Electrical Engineering Department, City and Guilds College, London, S.W.7, not later than 1st October, 1954. 4956

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies:—

THIRD ASSISTANT ENGINEER (Construction)

CHILTERNS SUB-AREA HEADQUARTERS, BEDFORD (137/54.N). Candidates should have had experience in the construction of substations, the erection of overhead lines, the laying and jointing of underground cables at voltages up to 33 kV, and wayleave negotiations.

Salary in accordance with Class L, Grade 11 of the National Joint Board Salary Agreement, commencing at £717.

Apply to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford.

(i) THIRD ASSISTANT ENGINEER.
(ii) JUNIOR ENGINEER.

BEDFORD DISTRICT, CHILTERNS SUB-AREA (134/54.R). Candidates for (i) should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations. For (ii) they should have had a sound general and technical education and should possess the Higher National Certificate or equivalent qualification. Some experience of H.V. and L.V. distribution systems is desirable.

Salaries will be in accordance with Class F of the National Joint Board Salary Agreement as follows:—

(i) Grade 9, commencing at £607.
(ii) Grade 14 at £466.

Apply to the District Manager, Eastern Electricity Board, Prebend Street, Bedford.

GENERAL ASSISTANT ENGINEERS. Required in the following localities:—

(1) Bedford District, Chilterns Sub-Area (134/54.R).
(2) Aylesbury District, Chilterns Sub-Area (135/54.R).
(3) King's Lynn District, Norfolk Sub-Area (138/54.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of underground and overhead systems, including substations.

Salary in accordance with Grade 11 of the National Joint Board Salary Agreement as follows:—

(1) Class F, commencing at £548.
(2) and (3) Class E, commencing at £524.

Apply as follows:—

(1) District Manager, Eastern Electricity Board, Prebend Street, Bedford.
(2) District Manager, Eastern Electricity Board, Exchange Street, Aylesbury, Bucks.
(3) District Manager, Eastern Electricity Board, Gaywood Bridge Offices, Wootton Rd., King's Lynn, Norfolk.

Future salaries and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned with fourteen days of the appearance of this advertisement. 4997

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Western Sub-Area Drawing Office in Central London.

Candidates should have a good general and technical education with experience of tracing, lettering, isometric and freehand drawings.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £458 to £595 7s. per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, E.C.2, to be returned completed by 18th September, 1954. Please enclose addressed envelope and quote ref. V/1810/R. 5001

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS invited for superannuable N.J.B. appointments at Divisional Headquarters, as follows:—

GENERATION (CONSTRUCTION) DEPARTMENT (Vacancy No. 89/54).

1. SECOND ASSISTANT ENGINEERS, AX/CX 2, £834-£1,025.

Applicants should preferably be Corporate Members of the Institution of Mechanical and/or Electrical Engineers, or exempted from the appropriate examination, and have experience in power station construction; be able to make investigations and prepare schemes and specifications for new projects.

2. THIRD ASSISTANT ENGINEERS, AX/CX 5, £649-£835.

Applicants must possess H.N.C. or equivalent. Required to assist 2nd Assistant Engineers as above.

3. GENERAL ASSISTANT ENGINEERS AX/CX 8, £501-£675.

Applicants should have a knowledge of mechanical or electrical practice in power stations. H.N.C. or equivalent desirable.

DIVISIONAL TECHNICAL DEPARTMENT (Vacancy No. 90/54).

GENERAL ASSISTANT ENGINEER AX/CX 8, £501-£675.

Candidates should possess a degree or H.N.C. in Electrical engineering; some experience in the manufacture, design or erection of high voltage transmission equipment desirable. Required to assist in the design of a 132 kV transmission system and in the investigation of a wide range of system problems including fault calculations and load flow studies.

GENERATION (OPERATION) DEPARTMENT (Vacancy No. 92/54).

GENERAL ASSISTANT ENGINEER (Efficiency, Testing and Combustion), AX/CX 8, £501-£675.

Applicants should possess H.N.C. Experience in the operation and efficient control of high pressure steam plant desirable.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff to be returned by 24th September, 1954. 4998

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule A of the Agreement:—

(a) ASSISTANT SHIFT CHARGE ENGINEER at Ironbridge Power Station, Grade H9, commencing at £680 per annum (Vacancy No. 752MD).

(b) BOILER HOUSE SHIFT CHARGE ENGINEER at Nechells A Power Station, Grade F9, commencing at £607 per annum (Vacancy No. 753MD).

Applicants for these positions should have received a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear, including for (b) a knowledge of pulverised fuel firing. Appropriate qualifications an advantage.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 25th September, 1954. 4999

ELECTRICAL AND MECHANICAL ENGINEER

required by BASRAH PORT DIRECTORATE, IRAQ, for one year in first instance. Salary equivalent to £1,200, rising to £1,440 a year. Provident fund. Free passages. Liberal leave on full salary. Candidates, Graduates of the Institution of Electrical Engineers or equivalent must be experienced in the operation of medium-sized electricity undertakings and in erecting and maintenance of H.T. and L.T. overhead and undergound systems, A.C. distribution systems and substation plant. Small diesel power station experience would be useful. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30334/EF. 4928

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

GENERAL ASSISTANT ENGINEERS (Civil), Generation Construction Department, Divisional Headquarters, Portsmouth (S/13.563). Applicants should have had a sound technical training and some experience in heavy civil engineering work, preferably in the construction of large power stations, or in one or other of the following:—

(a) Piled and reinforced concrete foundations.
(b) Wharves and jetties, or tunnelling.
(c) Steel frame and reinforced concrete buildings.
(d) Land and hydrographical surveying.

Applicants should possess qualifications leading to Corporate Membership of the Institution of Civil Engineering. The successful candidate will be engaged on works suitable for submission for Part C of the Institute's Examination. Facilities for further study are available at the Portsmouth College of Technology.

Salary N.J.B. AX/CX 8, £501-£675.

ASSISTANT ENGINEER (Efficiency), Southampton Generating Station (S/13.564). Applicants must have had a sound technical training, should possess qualifications leading to Corporate Membership of an appropriate professional institution, and should have experience in the operation of a modern generating station. Preference will be given to candidates with a knowledge of the work of an efficiency department.

Salary N.J.B. F/9, £607-£629.

Special application forms obtainable from the Divisional Secretary, 111, High Street, Portsmouth, should be returned by 22nd September, 1954. 4988

BRITISH INSULATED CALLENDER'S CABLES LTD.

invite applications for the following vacancies with their Telecommunications Laboratory at Kirkby, Near Liverpool.

(i) SECTION LEADER for a small team engaged on the development of accessories for paper and plastic insulated telecommunication cables. Candidates with some previous experience in this direction would be preferred.
(ii) Several PHYSICISTS or ELECTRICAL ENGINEERS for the development of: telecommunication cables and accessories, open wire transmission lines, measurement techniques, test gear and process control equipment, including servo systems.
(iii) MECHANICAL ENGINEERS for development work on telecommunication cable machinery.
(iv) MATHEMATICIAN of first rate ability for investigation of telecommunication transmission problems.

The vacancies call for candidates qualified to degree standard as appropriate, and in the case of item (iv) a first class degree is essential. Candidates qualified to H.N.C. standard and with some previous experience will be considered against (ii) and (iii). Opportunities for advancement are available and remuneration is at competitive levels.

Applications quoting reference P/45/54 should be submitted to the Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. 4776

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 162/54/R. ASSISTANT SHIFT CHARGE ENGINEER, Agecroft "B" Generating Station, near Manchester. Salary £641/£667 (G.9). Closing date 16th Sept.

Vacancy No. 164/54/R. SHIFT CHARGE ENGINEER, Radcliffe Generating Station, Lancs. Salary £697/£718 (F.7). Closing date 18th Sept.

Vacancy No. 165/54/R. SHIFT CHARGE ENGINEER, Roosecote Generating Station, Barrow. Salary £729/£758 (G.7). Closing date 18th Sept.

Applications to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20, quoting vacancy number. 4957

AIR MINISTRY

MECHANICAL AND ELECTRICAL ENGINEERS required in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (a) Main Grade, Salary Scale £1,000 to £1,320; (b) Assistant Grade, £650 to £1,000. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long term possibilities. Special allowance up to £1,500 a year according to location, payable in addition to salary during overseas service. Candidates must be natural born British subjects of natural born British parents.

Minimum qualifications and experience for both grades of posts:—

(i) (a) University degree or equivalent diploma in Electrical and/or Mechanical Engineering and at least a two year apprenticeship or (b) Graduate or Corporate Membership of the Institution of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship and (ii) employment in responsible position for minimum of three years with well-established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms, quoting reference D1/54A from M.L. and N.S., Technical and Scientific Register (K.), Almack House, King Street, London, S.W.1. 4942

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

THIRD ASSISTANT ENGINEER (PLANNING), SHROPSHIRE AND HEREFORDSHIRE SUB-AREA HEADQUARTERS.

Applicants should have had experience in planning extensions of E.H.T. substations, transmission and distribution systems. Technical qualifications desirable. Salary £641/£667 per annum (N.J.B. Class G, Grade 9). Apply in writing within 14 days, stating age, experience, present salary and position, to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, STONE DISTRICT, NORTH STAFFORDSHIRE SUB-AREA.

Applicants should have had a sound technical training and experience in the preparation of wiring schemes and estimates for domestic, farm and industrial installations. Duties will include advice to consumers on supply matters and sales of domestic and farm equipment. Technical qualifications desirable. Salary £592/£610 per annum (N.J.B. Class D, Grade 8). Apply in writing within 10 days, stating age, experience, present salary and position, to District Manager, Midlands Electricity Board, High Street, Stone, Staffs.

A. STEPHENS,
Secretary.
4996

AUCKLAND UNIVERSITY COLLEGE

University of New Zealand

APPLICATIONS are invited for a LECTURESHIP IN ELECTRICAL ENGINEERING.

Candidates should be Graduates in Electrical Engineering. Experience in electrical measurements, transmission and distribution of electricity, or high frequency or line communication will be an advantage.

The salary scale for the position is from £800 to £950 per annum plus a recent general increase of £92 8s. per annum. Three annual increments of £50 are payable under this scale.

The successful applicant will be expected to take up his duties as soon as possible after appointment.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 5, Gordon Square, London, W.C.1.

The closing date for the receipt of applications, in New Zealand and London, is 15th October, 1954. 4929

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments subject to N.J.B. Agreement for Electricity Supply Industry:—

Area Board Headquarters

GENERAL ASSISTANT ENGINEER, Chief Engineer's Department, Meters Section, Ellison Place Testing Station, Newcastle upon Tyne. Applicants should hold Higher National Certificate in Electricial Engineering or equivalent qualification. Salary Schedule C, Grade 8, £501/£694.

Tyne Sub-Area

JUNIOR ENGINEERS at Sub-Area Headquarters, Newcastle upon Tyne. Applicants should hold Higher National Certificate in Electrical Engineering or equivalent qualification and have had suitable practical experience. Salary Schedule A, Class L, £451/£547. Starting salary will depend on qualifications and experience.

Harrogate Sub-Area

THIRSK DISTRICT. SECOND ASSISTANT DISTRICT ENGINEER with location at Bedale. Salary Schedule A, Class C, Grade 7, £599/£622.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4994

MIDLANDS ELECTRICITY BOARD

Appointment of Assistant Chief Engineer (Distribution)

APPLICATIONS are invited for the position of ASSISTANT CHIEF ENGINEER (Distribution) in the Engineering Department at Board Headquarters, Mucklow Hill, Halesowen, which will become vacant on 1st December.

Applicants should have had considerable experience in the design, construction, operation and maintenance of overhead line and underground cable systems and substations, together with their associate equipment at voltages up to and including 66 kV. Experience of 132 kV is desirable but not essential. Experience in operation and maintenance of a fleet of transport vehicles is also desirable.

Appropriate technical qualifications will be considered an advantage.

Salary will be N.J.M. Scale 4 (£1,600/£1,750 per annum).

Applications, stating age, experience and qualifications, should be made within 14 days to the Secretary (Ref. FWC), Midlands Electricity Board, Board Headquarters, Mucklow Hill, Halesowen, Near Birmingham.

A. STEPHENS,
Secretary. 4995

AIR MINISTRY

require in London, provinces and overseas ELECTRICAL ENGINEERING DRAUGHTSMEN in WORKS DEPARTMENT, experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. Salaries up to £780 p.a., starting pay dependent on age, qualifications and experience. Overtime or extra duty allowance payable. Promotion prospects. Posts non-pensionable with long term possibilities. Natural born British subjects only.

Write, stating age, qualifications, employment details, including type of work done, to Ministry of Labour, 236, Walworth Road, London, S.E.17, quoting Order 85.AS. 205

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

THERE will shortly occur 5 vacancies for STATION SHIFT CONTROL ENGINEERS. N.J.B. Grade (£577 to £598) F/10. Applicants should have control experience and preferably hold a Higher National Certificate.

Applications should be made within 14 days on a form to be obtained from me. The position is superannuable.

J. E. WHITTAKER,
Area Manager.
Millburn Street,
Aberdeen. 4993

BRITISH ELECTRICITY AUTHORITY

London Division

Third Assistant Engineer

Department of Chief Generation Engineer (O)

Vacancy No. 54/747

APPLICANTS should possess a good general and technical education to the standard required for Corporate Membership of the I.E.E. or the I.Mech.E. and should have some experience of Generating Station operation.

Clarity of expression and ability to compile concise and readable reports also essential qualifications. Successful candidate will be required to prepare technical reports, to edit fault reports, and to assist in the preparation and progressing of plant overhaul programmes.

Conditions of service and salary in accordance with N.J.B. Agreement, Schedule C, Class AX/EX, Grade 5 = £681 9s./£927 3s. p.a. including London allowance.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box No. 136, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. 4989

APPLICATION ENGINEERING

APPOINTMENTS are available with THE ENGLISH ELECTRIC COMPANY LIMITED, on important work covering Application Engineering on all classes of electrical equipment. These appointments are pensionable after a qualifying period and apprentice trained men with Higher National Certificate in Electrical or Mechanical Engineering or equivalent, and with previous experience on Application work are preferred.

Experience in the manufacturing or power supply industries or in the application or installation of electrical equipment in any branch of industry or engineering is an alternative qualification and professional engineers in these fields are also invited to apply.

A number of vacancies also exist for apprentice trained engineers seeking an opportunity of acquiring Application Engineering experience. Reply stating age, experience, qualifications, and quoting Ref. S.A. 33D., to—Dept. C.P.S., 336/7, Strand, London, W.C.2. 4945

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post:—

JUNIOR ENGINEER, PETERBOROUGH GENERATING STATION. Salary Class F, Grade 15, £402 to Grade 14, £466 per annum. Commencing salary depending upon qualifications and experience.

The duties of the successful applicant will include assisting in the control room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14, by 18th September, 1954.

W. N. C. CLINCH,
Controller.
4938

TRANSFORMER DESIGNER

required by well-established transformer manufacturers in North West London area. Experience in all types of transformers up to 20 kVA essential.

Permanent progressive position, pensions scheme and life assurance. Write stating age, experience and salary required.—Box 5006.

WARWICKSHIRE COUNTY COUNCIL

Architect's Department

Appointment of Electrical Engineering Clerk of Works

APPLICATIONS are invited for the above appointment from persons who have practical experience in electrical installation work for lighting, power and allied services, for supervision of contracts in schools and similar buildings.

Applicants should have had experience as foreman on contracts of £10,000 and over and at least 15 years' experience. Salary £580 × £15 to £625 per annum.

The appointment is on the established staff and will be subject to the provisions of the Local Government Superannuation Acts 1937-53. The successful candidate will be required to pass a medical examination.

Applications to be made on a form which can be obtained from G. R. Barnsley, F.R.I.B.A., County Architect, Shire Hall, Warwick. Forms to be completed and returned by 15th September, 1954.

L. EDGAR STEPHENS,
Shire Hall, Clerk of the Council.
Warwick.
August, 1954. 4926

BRITISH ELECTRICITY AUTHORITY

South Western Division

Technical Staff Vacancies

(a) SHIFT CHARGE ENGINEER, Plymouth "B" Generating Station. N.J.B. G.7, £729-£758.

(b) STATION SHIFT CONTROL ENGINEERS (2), East Yelland Generating Station. N.J.B. G.10, £608-£630.

Superannuation Scheme.

Candidates for (a) should have had considerable experience in a modern generating station. Graduate or Corporate Membership of a recognised Engineering Institution, or equivalent, desirable.

For (b) should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 20th September, 1954. 4961

SOUTHERN ELECTRICITY BOARD

Planning Engineer

BASINGSTOKE District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class D, Grade 7 (£633-£638-£643 per annum). N.J.B. conditions of service.

The duties of the post will be to assist in the preparing of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks and substations of all types operating at voltages up to 33,000 volts.

Applicants should possess technical qualifications up to A.M.I.E.E. standard.

The successful candidate for the above appointment will be required to constribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 24th September, 1954. 5028

SOUTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER, TORBAY. Salary N.J.B. Class F, Grade 7, £697 to £718 p.a.

Duties include supervision of construction of overhead lines and substations, and the laying and jointing of underground mains, on H.V. and M.V. distribution systems up to 33 kV, throughout the District. Field experience of construction work essential, and knowledge of building construction and graduate membership of the I.E.E. are desirable.

Applications on forms obtainable from District Manager, Electric House, Union Street, Torquay, to be returned by the 24th September, 1954. 5002

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

Senior Assistant Engineer, Generation (Operation) Department

SENIOR ASSISTANT ENGINEER required in Generation (Operation) Department at Divisional Headquarters, Portobello.

Candidates must have highest technical qualifications in electrical and/or mechanical engineering, and should preferably have a first-class degree or equivalent in electrical or mechanical engineering, together with Corporate Membership of the Institution of Electrical and/or Mechanical Engineers, and some experience in the design, operation and maintenance of steam electric power stations.

Salary £970-£1,134 (N.J.B. Class AX/B) Grade 1). Appointment superannuable.

Applications on form AE.6/ACT, obtainable from Divisional Controller, British Electricity House, Portobello, Midlothian, should be completed and returned by 25th September, 1954.

5001

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited for the post of MAINTENANCE ENGINEER (Electrical) in the Board's Aberdeen Power Station, from qualified engineers with good practical experience of power station equipment, transformers and switchgear for 132/33/6.6 kV and the associated protection and control of power systems.

Salary will be in accordance with N.J.B. Agreement, Class F, Grade 6. The position is superannuable.

Applications should reach the undersigned by 18th September, 1954, giving personal details, experience and technical qualifications and should state period of notice required before appointment could be taken up.

J. E. WHITTAKER,
Area Offices, Area Manager.
Millburn Street,
Aberdeen. 4958

CHIEF ENGINEER

required to commence duty as early as possible and to control drawing office, development and design.

Must have technical and practical experience of switchgear up to 11 kV and preferably some knowledge of motor control gear. He must be a Member or Associate Member of the Institution of Electrical Engineers.

Good permanent and progressive position for the right man. Pension scheme in operation.

Apply by letter, marked personal, giving full particulars of experience, salary required, to Managing Director, Erskine, Heap & Co. Ltd., Lancashire Switchgear Works, Manchester, 7. 4911

STAFFORDSHIRE COUNTY COUNCIL

Education Committee

APPLICATIONS are invited for ELECTRICAL ENGINEERING ASSISTANTS within the salary grade A.P.T. I to IV (£490 to £625 per annum).

Applicants should have passed Part I of the I.E.E. Associate Membership Examination or hold equivalent qualifications.

Form of application and further particulars can be obtained from: The County Education Architect, Green Hall, Lichfield Road, Stafford, and should be returned within 10 days of this advertisement. 4959

SOUTH EASTERN ELECTRICITY BOARD

ELECTRICIAN (Contracting Dept.), Croydon District. Wages 4s. 2½d. per hour for 44-hour week. Applicants must be fully experienced in all classes of installation and maintenance work, including screwed conduit, Pyrotenax and trunking systems.

Applications, naming 2 referees, to H. Lowe, M.I.E.E., Manager Croydon District, SEEBoard, Electric House, Wellesley Road, Croydon, by 22nd September, 1954.

A. L. BURNELL,
Secretary. 5003

SURREY EDUCATION COMMITTEE

County Technical College, Stoke Park, Guildford

REQUIRED January, 1955 or earlier, GRADE A ASSISTANT to teach ELECTRICAL ENGINEERING in Ordinary National Certificate classes. Ability to assist with electrical installation subjects desirable.

Application form and further particulars may be obtained by sending stamped addressed foolscap envelope to the Principal. Completed forms should be returned by 25th September. 4987

METROPOLITAN-VICKERS ELEC. CO. LTD.

require DESIGN DRAUGHTSMEN for METALCLAD and HIGH VOLTAGE SWITCHGEAR DEVELOPMENT.

Senior and junior positions available according to experience.

Applications, giving details of experience, age, etc., should be addressed to the Personnel Manager, Metropolitan-Vickers Elec. Co. Ltd., Trafford Park, Manchester, 17.

4912

DRAUGHTSMEN

SENIOR ELECTRICAL DRAUGHTSMAN experienced in power and lighting installations applicable to the refinery, chemical and industrial projects urgently required by THE LUMMUS COMPANY LIMITED, Designing Engineers and Constructors to the Petroleum and Chemical Industries. Salary commensurate with qualifications and experience. Apply, quoting reference DPL/39, to the Personnel Officer, The Lummus Company Limited, 80, Regent Street, London, W.1. 4939

A LEADING firm in the lighting industry requires two first-class designers for design work in their fittings department. Work will be concerned with special designs and new developments and offers very attractive prospects and salaries for men with real initiative and a sound experience in this field. Applications should be addressed to the Staff Manager, Box 4930, giving full details of training, experience and qualifications.

A WELL-known firm of electrical component manufacturers require able young man to take charge of small assembly section. Some electrical knowledge and ability to control female staff is essential. Modern factory in Wandsworth (London). Write, giving full details of experience, age and salary required, to— Box 94.

ALKALINE BATTERIES Ltd., of Redditch, are the largest makers in the Empire of alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its technical sales and development sections for graduate electrical engineers, not over 30 years of age, or for men nearing the end of their degree course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed —Commercial Manager, Alkaline Batteries Ltd., Union Street, Redditch. 3936

AN opportunity occurs in progressive manufacturing concern in London area for engineer aged 25/35 with electrical or physicist degree, on development and research work on high frequency telecommunication cable and associated testing equipment. Salary will be commensurate with qualifications and experience. Apply, giving full particulars, to—Box 4962.

APPLICATIONS are invited for the post of technical engineer in the sales dept. of Messrs. Igranic Electric Co. Ltd., Bedford (a company in the Metal Industries Group). An O.N.C. in Electrical Engineering is a minimum requirement; practical experience in estimating and quoting for all types of A.C. and D.C. contactor equipment desirable, although training can be given to applicants having a suitable background. Age 25/35. Please apply in writing, stating age, qualifications, salary required, etc., to the Group Training and Personnel Officer, Metal Industries Limited, 60, Buckingham Palace Road, London, S.W.1. 4941

APPLICATIONS are invited for radio and television salesman-mechanic. Applicants must be able to service and maintain all types of radio and T.V. sets, and must possess qualifications of the recognised trade bodies. No house available. Applications, in writing, stating age, experience, wages required (no overtime paid), with copies of recent testimonials, to be sent to —General Manager, Musselburgh & Fisherrow Co-operative Society Ltd., Musselburgh, not later than Wednesday, 15th September, 1954. 4990

ASSISTANT chief engineer required by company engaged in the design and development of guided weapons. Candidates must be mechanical engineers with first-class qualifications and experience in electronics and light engineering. Knowledge and experience in servo-mechanisms essential since duties would include responsibility for missile control systems, electrical gyros, accelerometers, etc. Applicants should be 30-35 years of age and have sufficient personality and experience to administer and organise the development activity on these subjects. Write in detail, quoting reference G, to—Box AC.91032, Samson Clarks, 57/61, Mortimer Street, London, W.1. 123

ASSISTANT electrical engineer with experience F.H.P. motor design for development work on motorised equipment for aircraft fuel systems. Qualification H.N.C. or equivalent. Apply, giving full particulars, to—Self-Priming Pump & Engineering Co. Ltd., Trading Estate, Slough, Bucks. 4964

ASSISTANT electrical engineer required for the electrical department of a large industrial undertaking in the London area. Applicants should preferably hold a degree in electrical engineering or an equivalent qualification, and should have a knowledge of the design, operating and testing of electrical installation in factories, including H.T. and L.T. switchgear. Drawing office experience and the compiling of specifications and schedules, reports and estimating. Apply giving full details of age, qualifications, experience and salary to—Box 5007.

CAPABLE, practical man required to run small winding and repair shop on profit sharing basis. Experienced manufacture and repair all types of fractional h.p. motors. London district.—Box 5009.

CHARTERED patent agents (London) require services of a young technical assistant having a good grounding in electrotechnology. Some knowledge of telecommunication system, including automatic telephone exchange systems, preferred. Successful applicant will be given opportunities to sit for Patent Agents' qualifying examinations. Write stating age, educational and technical qualifications, experience, and salary required, to—Box 4931.

CONTRACTS engineers required for handling of switchgear tenders and contracts. Applications should state age, experience, qualifications and salary required and should be addressed to—Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 4965

COOKE & FERGUSON Limited, switchgear specialists, require sales engineers for engineering of schemes and preparation of tenders for indoor and outdoor switchgear. A knowledge of protection is essential, and applicants must be qualified in electrical engineering to at least H.N.C. standard. Salary commensurate with qualifications and experience. Please reply stating age, experience and qualifications to—Personnel Officer, Saxon Works, South St., Openshaw, Manchester, 11. 4806

DESIGN draughtsman required, preferably aged 25-35, for work on light electrical mechanisms or instruments. H.N.C. preferred. Pension scheme, canteen. Write in tabulated form to—Personnel Manager, Dowty Equipment Ltd., Arle Court, Cheltenham. 4825

DESIGN engineer required by consulting engineers for preparation of electric light and power schemes and specifications for all types of buildings. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles & Partners, 32, Old Queen Street, Westminster, London, S.W.1. 4970

DRAUGHTSMAN (electrical) required by West London firm for the layout of power and lighting installations and illumination schemes. Applicants should possess O.N.C. or equivalent and have served a recognised apprenticeship. Apply stating age, experience and salary required to—Box 4844.

DESIGNER required for work on medium and high-voltage power factor correction and furnace capacitors. Must have degree or H.N.C. or the equivalent in electrical engineering, and experience in the design and manufacture of medium/heavy electrical equipment. Good prospects. Write, giving full details of qualifications, age and salary required, to—The Technical Director, A. H. Hunt (Capacitors) Ltd., Bendon Valley, London, S.W.18. 71

DRAUGHTSMAN required by consulting engineers for the reproduction of electric light and power schemes. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles and Partners, 32, Old Queen Street, Westminster, London, S.W.1. 4969

DRAUGHTSMAN required for detail work on specifications necessary for manufacture of paper capacitors. Write or call—A. H. Hunt (Capacitors) Limited, Bendon Valley, Garratt La., Wandsworth, London, S.W.18. 95

DRAUGHTSMAN required for design and detail work on electrical/mechanical apparatus. Should be at least of H.N.C. standard. Workshop experience essential. Apply in writing to — Personnel Manager, A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, London, S.W.18. 41

DRAUGHTSMAN required for electric elements and thermal devices manufacturers. Knowledge of presswork and press tool design an advantage. A distinct opportunity. House available if required. Five-day week. Pension scheme, canteen, etc. State briefly age, experience, technical training, salary, whether married with family, to—Works Manager, Best Products Ltd., Felixstowe, Suffolk. 4914

DRAUGHTSMAN required immediately for Ministry of Supply contracts. Must be used to instrument work. Ordinary National Certificate an advantage. Apply to General Manager, Hendrey Relays Limited, 392, Bath Road, Slough, Bucks. 5010

DRAUGHTSMAN-designer. Must have good technical qualifications and experience of high grade electric switchgear of up to 11 kV. Good prospects, 5-day week. Temporary accommodation is available for successful candidate from outside the Birmingham area. Apply giving age and salary required.—Personnel Dept., George Ellison Ltd., Perry Barr, Birmingham, 22b. 4972

DRAUGHTSMEN required. Excellent opportunity to broaden experience with well-established company, whose wide range of products avoids restrictive specialisation. There are vacancies for seniors and juniors with at least Ordinary National Certificate. On well served transport routes. Near City centre and amenities. Saturday interview if required. Apply—Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5012

DRAUGHTSMEN required for mechanical design of compressed air components. Some mechanical experience essential. Applications, giving details of experience, age, etc., should be addressed to the Personnel Manager, Metropolitan-Vickers Elec. Co. Ltd., Trafford Park, Manchester, 17. 4913

DRAUGHTSMEN, sound experience of detailing light mechanical or electromechanical equipment, required in London by a large engineering organisation. Salary above Union rates, excellent conditions, pension scheme, living allowance. Please write, giving full particulars of experience and qualifications, to—Box 4966.

DRAUGHTSMEN, sound experience of switchgear, required by consulting engineers for work in Manchester and Chester. Good salary, pension scheme, living allowance. Please write, giving full particulars of experience and qualifications, to—Box 4967.

DRAUGHTSMEN, sound knowledge of electrical engineering, required by consulting engineers for permanent positions in their Bath offices. Good salary, excellent conditions, pension scheme. Please write, giving full particulars of experience and qualifications, to—Box 4968.

ELECTRICAL circuit draughtsman for manufacturer of automatic temperature controls. Permanent pensionable post for man up to 50 years old. Written applications to—DHS, The Rheostatic Company Limited, Slough, Bucks. 4948

ELECTRICAL contractors, London, W.1, require experienced estimator. State age, experience and salary required, to—Box 4932.

ELECTRICAL contractor (London) has vacancy for estimator used to large contracts, capable of handling them from enquiry to completion. Exceptional opportunity for experienced man able to accept responsibility. Applications will be treated confidentially. State age, salary, with concise particulars of experience.—Box 5018.

ELECTRICAL design draughtsmen and electrical draughtsmen required in Hammersmith office for work connected with heavy construction, industrial plant, general power and lighting schemes. Write giving full details of training and experience, to—George Wimpey & Co. Limited (E. T. Beaumont, Dept. 1), 27, Hammersmith Grove, London, W.6. 4943

ELECTRICAL draughtsman required, 21/26 years, for the electrical division of the engineering department of medium/heavy engineering industry. Should have experience in preparation of drawings for electrical installation work and circuit diagrams. Applications to Personnel Manager, Ruston-Bucyrus Ltd., Excavator Works, Lincoln. 5017

ELECTRICAL draughtsmen required for large industrial organisation in the London area. To have a knowledge of electrical circuits for power and lighting installations and electrical plant layout for factories, and should preferably hold a Higher National Certificate. Reply in the first instance, stating education, age and salary required, to—Box 5008.

ELECTRICAL engineer, aged 23/28, with leanings towards commercial work, required by well-known porcelain insulator manufacturers in the Midlands. The successful applicant would receive training in H.T. insulator design department and would be considered for subsequent transfer to technical sales. Starting salary £450 to £750 p.a. according to age and qualifications.—Box 4973.

ELECTRICAL engineer, experienced in design and general arrangement of power and lighting systems required for head office appointment. Write giving full details of training and experience, to—George Wimpey & Co. Limited (E. T. Beaumont, Dept. 1), 27, Hammersmith Grove, London, W.6. 4944

ELECTRICAL engineer. Large firm of mechanical engineers, 6 miles west of Manchester, invite applications for the position of electricial engineer. Applicants should have a good education (preferably with a university degree) and practical experience in electrical engineering. A knowledge of electronics as applied to machine tools, general plant maintenance and heating systems desirable, but not essential. Pension scheme. Apply with details of age, education, experience and salary required, to—Box 5020.

ELECTRICAL engineer required as manager of old established firm of electrical contractors. Applicants should have a sound technical knowledge and be fully experienced in all aspects of contract procedure. Apply, giving fullest particulars in confidence, to—Managing Director, Doves (Darlington) Ltd., 24/26, Bondgate, Darlington. 7598

ELECTRICAL engineer required (aged 30-40, preferably chartered), to assume leading position, commanding equivalent £1,000 p.a. to start, in design office of London company. Applicants must be fully conversant with low and medium voltage automatic contactor gear, motors, relay systems, and methods of temperature control. Previous D.O. experience and a thorough knowledge of wiring systems applied to precision machinery is essential. Write in first instance — Personnel Manager, Molins Machine Co. Ltd., Evelyn Street, London, S.E.8. 4892

ELECTRICAL fitters are required by the British Electricity Authority at their Nottingham transmission section. The nature of the work involved includes the overhaul of 130,000-volt transformers and switchgear at transforming stations within the Nottingham section. Previous experience of H.V. apparatus would be an advantage. Rate of pay 45.00d. per hour, 44-hour week. Terms and conditions of service in accordance with N.J.I.C. agreement. Applications in writing to Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham. Please quote Vacancy No. 109/54/ER. 5005

ELECTRICAL research assistant. A large organisation in the North-West wishes to appoint a young man to evaluate the electrical properties of new insulation products. Possession of Higher National Certificate in Electrical Engineering is desirable. Apply to—Box 4800.

ELECTRICAL wholesalers require fully experienced counterhands/storemen. Apply Managing Director, Wilec Ltd., 90-96, City Road, London, E.C.1. 5016

ELECTRICIAN fitter wanted by East London firm. Man with tools and initiative. Able to work without supervision on plant maintenance and repairs. North Country training an advantage.—Box 4947.

ELECTRICIAN wanted, call.—Brice, 180, Drury Lane, London, W.C.2. 5015

ELECTRONIC/electrical engineer required to take charge of small laboratory. Applicant must have some years' experience in laboratory of manufacturers or large scale users of any of the following: cables, capacitors or insulation materials. Maximum age 35. London, E.11 area. Write fullest particulars.—Box 4915.

ELECTRONIC engineer. Applications are invited from experienced electronic engineers to design and provide measuring equipment required in connection with the development of rocket motors. Applicants should have a University degree and be able to initiate and, with the aid of a small team of assistants, perform a programme of work directed to the establishment of reliable and accurate methods of measuring strain, pressure, temperature, etc. Assistance with housing. Reply in writing to—G.S.M., I.C.I. Ltd., Metals Division, Summerfield Research Station, Kidderminster, Worcs. 4916

ELECTRONIC engineers required. Excellent opportunity for men of degree standard to broaden experience in a field of great interest and variety and involving latest techniques. Restrictive specialisation can be avoided by joining Marconi Instruments Limited who produce light current communications, measuring and test apparatus for a wide range of requirements. Saturday interview if required. Apply Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5014

ENGINEER required by British company for large modern sisal factory in Tanganyika. Salary will depend on experience but be in region of £800/£900 plus commission on profits. Usual overseas leave terms. Pension scheme. Please write, giving full particulars of experience, to—Box R.371, c/o Streets, 110, Old Broad Street, London, E.C.2. 4974

ENGINEER required for operational tests and maintenance of airborne electronic equipment. Degree, H.N.C. or equivalent, with some practical experience of electronic equipment desirable. Must be British or Commonwealth subject. Apply—Construction Dept., British Thomson-Houston Co. Ltd., Rugby. 4917

ENGINEERS required for maintenance and design of electronic test equipment, quality control and investigational work on thermionic valves. Inter B.Sc., or Higher National Certificate standard. Apply, giving full particulars of age, qualifications and experience, to—Personnel Superintendent, The Edison Swan Electric Co. Ltd., Cosmos works, Brimsdown, Enfield, Middlesex. 5019

ENGLISH ELECTRIC GUIDED WEAPONS DIVISION, Luton, require a senior systems engineer to take charge of a newly formed group. Experience should cover the design and development of mechanical and electro-mechanical devices together with a knowledge of hydraulics or electronics and servo systems theory. The appointment commands a substantial salary and the successful applicant will be given housing assistance. Applications giving full particulars of previous experience should be addressed to — Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. 1181C. 4946

ESTIMATING (sales) clerk (male) aged 21/30 required. Good standard in maths. and general education essential. Progressive, superannuation, sports. Permanency for right man. Apply—Personnel Officer, Southern United Telephone Cables Ltd., Dagenham Dock. 4963

ESTIMATOR'S assistant required by electrical contractors near Marble Arch, (London), some knowledge essential. Write, stating age, experience and salary required, to —Box 4933.

EXPERIENCED switchgear estimating engineer for preparation of tenders for E.H.T. stations. Apply by letter, stating experience, age, salary.—Switchgear Estimating, G.E.C., Birmingham, 6. 7603

EXPERIENCED instrument panel wiremen required S.E. London. Good prospects.—Box 7559.

EXPERIENCED senior draughtsmen required by large engineering company in the City. Successful applicants will be paid in accordance with their ability, experience and desire to work. The company would like their draughtsmen to make a career of the drawing office and is willing to pay ample salaries to the right men to ensure they remain in our employ and do a reasonable day's work. No trouble makers need apply. Five-day week, pension scheme. Apply to Box 4829, giving full particulars of age, education and experience.

EXPERIENCED X-ray engineer required for firm in U.S.A. to service mass miniature X-ray equipments. Applicant must be prepared to emigrate to U.S.A. Please apply—Sierex Ltd., 262/4, Regent Street, London, W.1. 4977

FERGUSON PAILIN Ltd., Higher Openshaw, Manchester, 11, have vacancies at head office for qualified switchgear engineer with some sales or contracts experience. Good salaries will be paid to competent men having the ability to progress. Duties will involve principally the preparation of tenders and subsequent engineering specifications for substation and power station switchgear. Applications to the Personnel Manager. 4955

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FOREMAN winder to take control of repair shop. Apply — Priory Electric Service (Coventry) Ltd., 3, Lower Ford Street, Coventry. 4866

HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd., Walton-on-Thames, Surrey, require experienced engineers for their transformer and/or rectifier estimating departments. Applications to be made in writing giving full details. 4702

INSPECTOR required for inspection work in the electrical cable industry, Manchester area. Sound mechanical engineering knowledge and/or experience of draughtsmanship essential. A knowledge of electro-technology would be advantageous.—Box 4978.

INSTALLATION and maintenance engineer for H.F. equipment required by the General Electric Co. Ltd. at their Wembley works. Applicants should have previous experience in this type of work and be prepared to travel in this country. Apply in writing, giving full details and quoting reference 'P.H.', to the Staff Manager, Magnet House, Kingsway, London, W.C.2. 5022

INSTRUMENT mechanic (electronic), O.N.C. (Elec.). For maintenance of electrical, electronic and mechanical metering and control equipment. Experience of test, repair and adjustment of such equipment essential. Successful applicant is required to work in Harlow New Town, Essex. Housing available in Harlow within a few weeks of engagement. Please write stating age, experience, etc., to—Personnel Manager, Rectifier Division, Standard Telephones and Cables Ltd., Warwick Road, Boreham Wood, Herts. 4927

JOHNSON & PHILLIPS Ltd., have vacancies in their transformer department for transformer draughtsmen having experience in all sizes up to 1,000 kVA. In addition vacancies exist for men having experience in sizes 1,000 kVA to 30,000 kVA and the higher voltages. Applicants should state age, training and experience, together with salary required, to—Employment Manager, Johnson & Phillips Ltd., Victoria Works, Charlton, London, S.E.7. 4951

LAB. technician required to undertake design and construction of test gear and carry out measurements of electrical properties of semi-conductor materials. H.N.C. standard and some practical experience. Apply in writing to—Director, Research & Development Dept., General Radiological Ltd., 15/18, Clipstone Street, London, W.1. 7582

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PLANT engineer. Large Manchester engineering firm with extensive machine shops and foundry, require a plant engineer to be responsible for electrical matters, heating system, mechanical handling equipment and miscellaneous works services. Applications are invited from men who have had a good education preferably to degree standard and practical experience in electrical matters and some or all of the other duties enumerated; and who can mix with works personnel of all levels. In addition, a knowledge of plant layout and electronics as applied to machine tools is desirable. Contributory pension scheme. Apply, stating age, education, experience and salary required, to—Box 5021.

SENIOR designer draughtsman with experience of electrical accessories preferred. Apply—C. H. Parsons Ltd., Wharfdale Road, Tyseley, Birmingham, 11. 5023

POWER engineer. A vacancy exists in a large pulp and paper mill near Calcutta under British management for a qualified power engineer with complete power house experience including operation and maintenance of W.T. steam boiler plant, turbines and auxiliary plant. Duties would include supervision and maintenance of all electrical equipment throughout the mill. Total emoluments including allowances Rupees 1,750 per mensem or approximately £1,570 per annum. Partially furnished quarters with servants provided. Contributory provident fund. Apply with full details of training and experience and copies of testimonials to —Box SE/12, c/o 95, Bishopsgate, London, E.C.2. 4980

PRODUCTION development engineer. The English Electric Company Ltd. require a fully qualified engineer at their Luton works to take charge of a department responsible for carrying out investigation work into new methods of the manufacture in the light electro-mechanical field. The successful applicant will have sound practical training and possess a thorough knowledge of the latest manufacturing methods. This is a senior appointment, providing facilities for practical production research work, carrying a salary commensurate with the responsibilities involved, and with housing assistance if required. Applications, which will be treated in strict confidence, should be addressed to—Dept. C.P.S., 336/7, Strand, London, W.C.2. 4918

REPRESENTATIVE required for electrical wholesalers. E.W.F., E.L.M.A., C.M.A., etc. Salary, commission and expenses. Apply, or telephone for appointment, giving details of experience.—Managing Director, E. Dawson (Lamp Factors) Ltd., 10, Grays Inn Road, London, W.C.1. 4919

REPRESENTATIVE to cover S.E. Scotland Electricity Board and N. of Scotland Hydro-Electric Board area. Applicants should be resident on the territory, have good contacts with architects, wholesalers and contractors, and possess their own car. This is an interesting and worthwhile post for a man with right background. Write in confidence to—The Sales Manager, M.K. Electric Limited, Wakefield Street, London, N.18. 4898

REPRESENTATIVE with good knowledge of high-class accessories, switchgear and small motors required in London area by The Jeary Electrical Co. Ltd., 324, Old Street, London, E.C.1 or (Phone: Mon. 8302). 4955

SALES engineer required, age 28/40, having wide sales and buying experience of diesel engines, boilers, turbines, alternators and electric motors, etc., to cover area around Manchester. Applicants must be generally conversant with the above types of plant and possess first-class business record. Transport provided. Brief but full details to—Box 4991.

SAO PAULO LIGHT & POWER Company Limited, a British company in Brazil, invite applications from suitably qualified men for the position of shift charge engineer in the Piratininga Power Station. The power station, which has recently been completed and is presently commencing operation, is situated near Sao Paulo (pop. 2.5 millions; temperate climate; 2,200 ft. above sea level). The plant comprises initially 2 80-MW, 1,800-r.p.m. steam turbo-alternator units, each supplied at 850 p.s.i., 900° F., by one 850,000-lb./hr. oil-fired boiler. Applicants should have a sound technical knowledge and wide experience of the operation of modern turbines and boilers, preferably with oil or pulverised fuel firing; should also have an aptitude for supervision and the maintenance of harmonious labour relations. Good salary, three years' agreement subject to renewal, with first class passage both ways; four months' paid leave after three years' service. Written application should be made to —Mr. W. P. Kellett, Joint Manager, Canadian-Brazilian Services Ltd., 148, Leadenhall Street, London, E.C.3. 4832

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SENIOR draughtsman required for light electro-mechanical design. A Higher National Certificate or equivalent qualification is desirable and preference will be given to applicants with previous fractional horse power experience. Please write giving details of qualifications, to—The General Electric Co. Ltd., Witton, Birmingham, 6. 4934

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SHIFT engineer. A vacancy exists for a shift engineer, working on a 4-shift cycle and responsible to the services and maintenance engineer, for the operation of all engineering and electrical services throughout the factory. Out of working hours the shift engineer will be responsible also for emergency maintenance work. Minimum educational standard H.N.C. Candidates must show evidence of having had a wide engineering experience and ability to lead men as well as control machines. Age limit 40. This post carries the status of foreman, but there are good prospects of advancement for suitable men. Staff privileges. Contributory pension scheme. Starting salary will be a high one, and will depend upon the qualifications and experience of the person appointed. Applications in writing, quoting E/S.E.2, and giving full personal, educational and industrial details, to—Personnel Manager, Ferodo Limited, Chapel-en-le-Frith, Via Stockport. 5024

SMALL old-established electrical business in Leeds area has an opening for a young man who is looking for advancement as a reward for his experience, knowledge and energy. Contracting, maintenance, motor repairs, etc. Applicant must be sound and reliable and like his work. Please give full details in confidence to—Box 7584.

STOCK department manager required by light engineering company in North London. Executive who has ability and considerable experience in controlling large stores and office staff. Age 35-45. Good conditions of employment and prospects of advancement. Commencing salary £700 p.a. Apply giving full details of experience to—Box 4704.

SUPERVISING and estimating engineer with commercial and industrial installation experience required for the Leeds branch of Edmundsons Electric Co. Ltd. Reply by letter in first instance, to 28, York Place, Leeds, 1, marked for attention of the manager, and setting out qualifications and experience. 4900

SURVEYOR required for long-term contract in Scotland. Must be conversant with surveying and profiling overhead line routes. References required. Good salary and subsistence. Apply — B. French Ltd., Pike Mills, Green Street, Kidderminster. 4736

TECHNICAL assistant required in the Manchester district for work on the development of electrical appliances, primarily domestic cookers. The applicant should possess a good practical knowlege of such work, together with a strong interest in theory. Arrangements can be made for continuation of studies, which will be encouraged. The salary offered will depend on the qualifications of the applicant.—Box 4981.

TECHNICAL assistants (electronic). Men required of Final Certificate City and Guilds Telecommunications standard and with experience in VHF and UHF. Men with compensating experience in these frequencies can be considered. Opportunity to broaden experience and avoid restrictive specialisation. Saturday interview if required. Apply Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5013

TECHNICAL clerk to handle incoming orders in office of automatic temperature control manufacturer near London. Electrical background necessary. Age up to 50.—Box 4949.

TECHNICAL representative required by pump and fan manufacturers' agent. Operating Midland counties. Knowledge of pump and fan applications desirable, but personality and integrity essential. Birmingham office. Car provided. Salary commission and expenses paid. Apply by letter, stating age, qualification, experience, salary required and whether married.—Box 7613.

TECHNICAL sales engineer, 28 years or over, to reside in the Midlands, preferably Birmingham, with sound knowledge of electrical and electronic instruments, mostly in audio frequency range. Able to do routine servicing. Covering central and southern Midlands and North London. Degree or H.N.C. standard. All expenses and car provided. Apply in writing, stating age, salary and experience, to—Box 5029.

THE JACKSON ELECTRIC STOVE Co. Ltd., of Luton, Beds, invite applications from design draughtsmen with creative ability and interest in design and development. Please give fullest details of training and experience in written application to the Personnel Manager, Clifton Road, Luton. 5025

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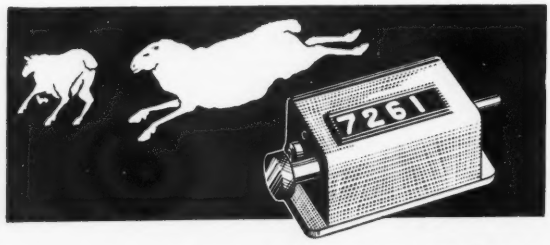

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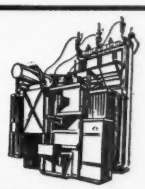

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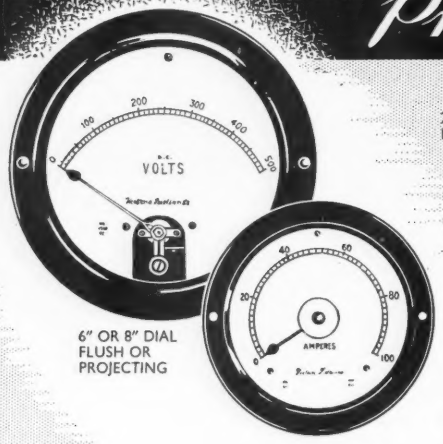

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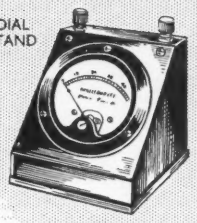

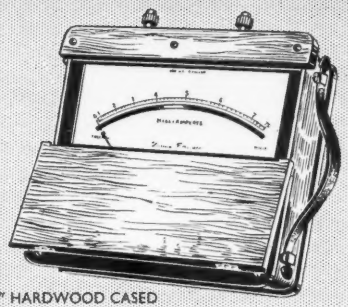

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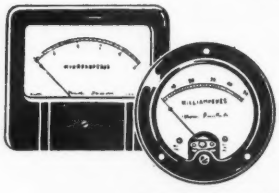

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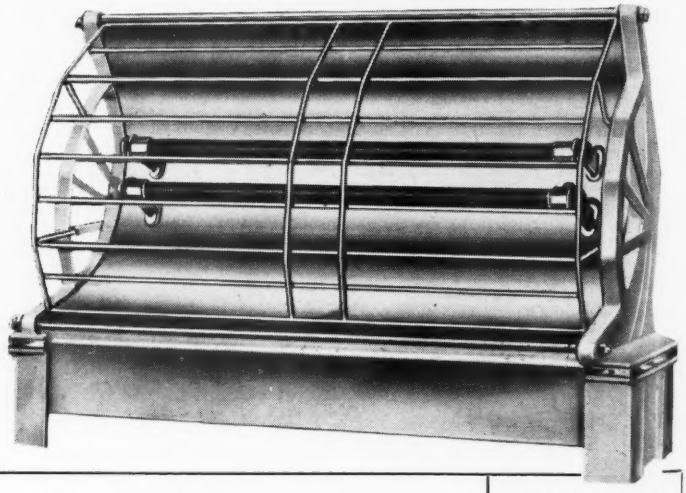

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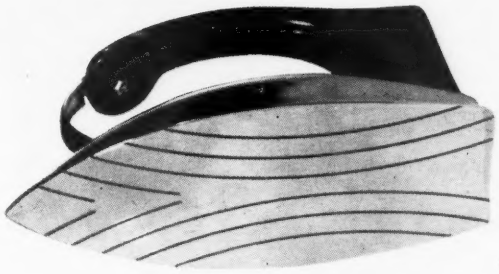

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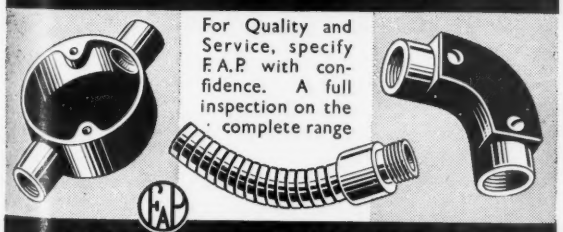

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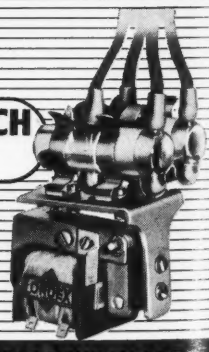

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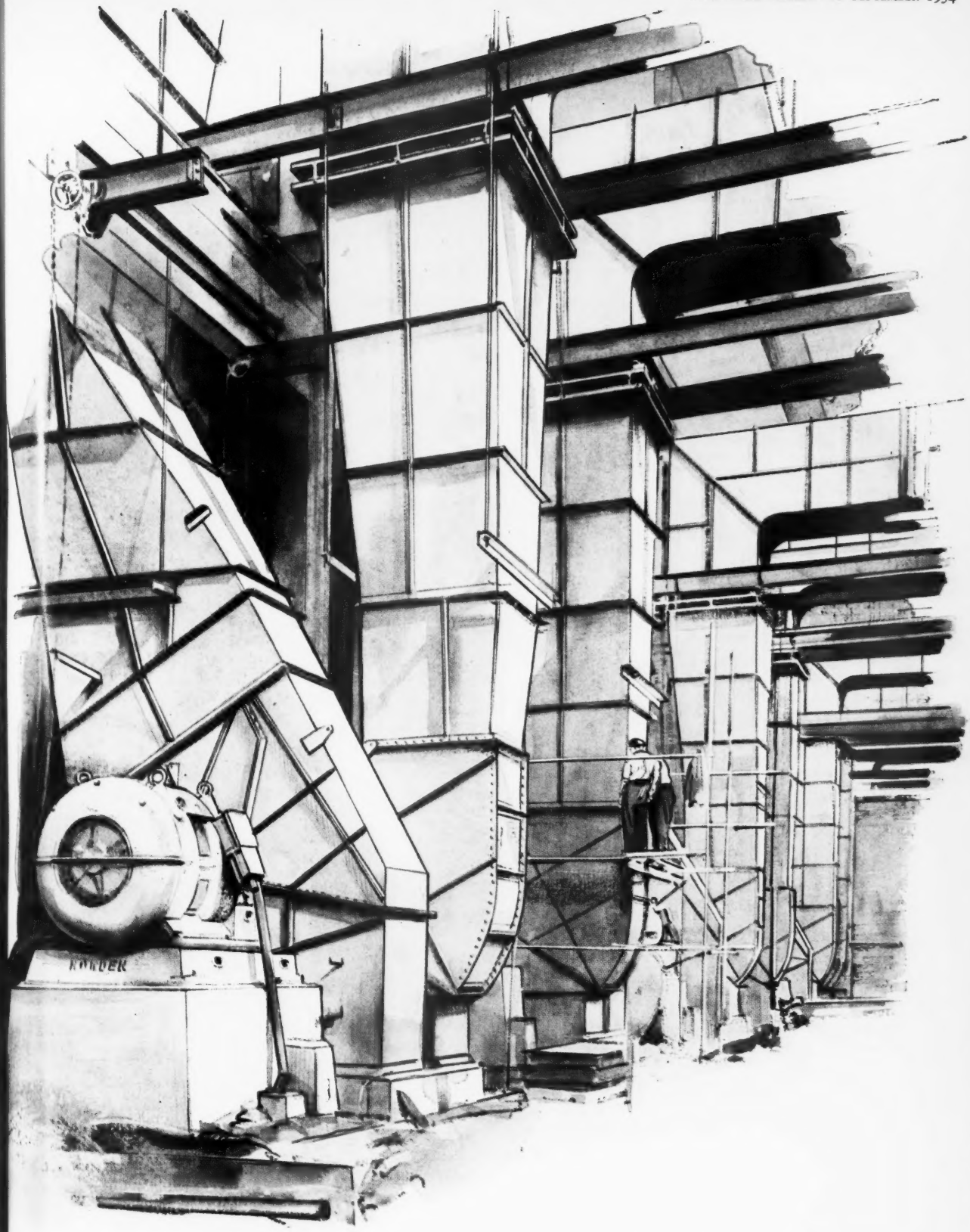

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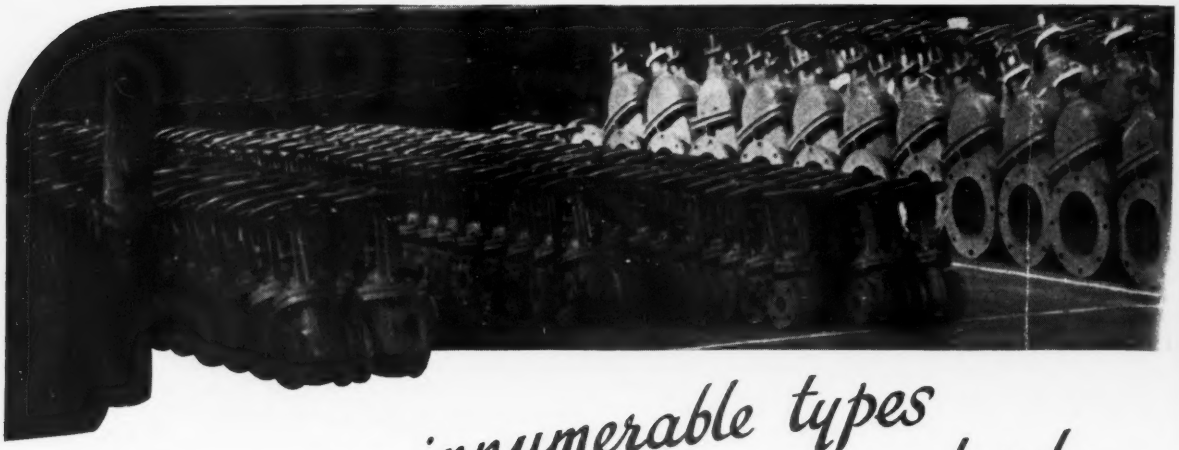

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